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E-Cigarette Dependence and Association with Cigarette Smoking

Theory, Evidence and Regulatory Policy

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Conceptual Framework for Understanding E-Cigarette Dependence

Why Is Dependence of Concern?

The 2018-19 Canadian Student Tobacco, Alcohol and Drugs Survey reported current e-cigarette use doubled (20%) among students in grade 7 to 12 since 2016-17, with prevalence higher among students in grade 10 to 12 (29%) (Government of Canada, 2019). Forty percent of these reported daily e-cigarettes use.

E-cigarette dependence is of concern both as an endpoint and as a determinant of long-term, regular use and associated potential harms.

As a determinant of long-term regular use, dependence is of concern because of its potential effects on respiratory, cardiovascular and other health outcomes. As an endpoint, e-cigarette dependence is a concern as it likely results in distress and both social and functional impairment similar to that of cigarette smoking dependence. The National Academies of Science Engineering and Medicine (NASEM) 2018 report on the health consequences of e-cigarettes provides an excellent review of the concerns of nicotine dependence as an endpoint. Of note is that tobacco use disorder is a diagnosis recognized by the *International Classification of Diseases*. Tobacco dependence is characterized by, “unpleasant withdrawal symptoms and by loss of behavioral control over use, which result in dependent individuals spending considerable time obtaining or using combustible tobacco cigarettes, interfering with the ability to fulfill important social or occupational role obligations and having a variety of other social and physical consequences (Fiore et al., 2008; Volkow et al., 2016)” (in NASEM, p. 255).

Importantly, tobacco use dependence is found not only in those with high levels of consumption, but also in infrequent and low intensity smokers (Japuntich et al., 2009; Reyes-Guzman et al., 2017 in NASEM). While dependence is primarily caused by nicotine, “non-nicotine factors” associated with tobacco self-administration (e.g., taste, smell, and sensations associated with the act of smoking) are critical to the establishment and maintenance of dependence on combustible tobacco cigarettes” (Fagerström, 2012 in NASEM).

The likelihood of becoming addicted to nicotine is far greater than the likelihood of becoming addicted to other substances including alcohol, cannabis and cocaine. Lopez-Quintero et al

(2011), for example, demonstrate that “67.5% of nicotine users, 22.7% of alcohol users, 20.9% of cocaine users, and 8.9% of cannabis users would become dependent at some time in their life”. The authors explain that the much higher rates for nicotine are due to absorption of smoked nicotine on extensive surface area of alveoli as compared with the rate of absorption of alcohol or cocaine in the nasal and gastro-intestinal mucosae (Lopez-Quintero et al 2011).

E-Cigarette Dependence

The NASEM report outlines why dependence on e-cigarettes is likely to mirror that of dependence on combustible cigarettes:

Given what is known about the role of nicotine and non-nicotine factors in tobacco product dependence, it is plausible that e-cigarette use may cause dependence symptoms, and the reason may not be explained merely by the fact the e-cigarettes are a nicotine delivery device. Most e-cigarette products are available in desirable flavors and have other characteristics that generate aerosols with a unique profile of pleasurable sensory stimuli due to the taste, sights, smells, and airway sensations, that (like combustible tobacco cigarettes) could have synergistic effects with nicotine on dependence risk. Such enjoyable sensory stimuli in combination with the delivery of “boluses” of nicotine via a pulmonary route (as in combustible tobacco cigarettes) may produce a dependence potential with e-cigarette use.

While NASEM (2018) indicates the plausibility of e-cigarette dependence, it is unknown whether e-cigarette dependence develops similarly to dependence on combustible cigarettes. Since NASEM, research has noted that the e-cigarette market is highly heterogeneous in the ability of devices to deliver nicotine. In order for nicotine from e-cigarettes to have addictive potential, it is necessary that vaped nicotine is absorbed sufficiently into the body (Browne & Todd, 2018). There is some evidence that more advanced generation e-cigarettes and those that are more highly powered increase plasma nicotine levels more effectively (Browne & Todd, 2018; Farsalinos et al., 2014; Vansickel & Eissenberg, 2012).

Type of nicotine may also affect nicotine delivery (i.e., nicotine salts may be better delivery agents). Physicians for Smoke-Free Canada (2020) provide an overview of the potential effects of protonated nicotine, noting that nicotine salts make e-cigarettes aerosol less harsh and, more

inhalable and capable of providing a smooth taste even with high levels of nicotine concentration. Data from JUUL's patent application demonstrate that their nicotine salt formulation delivered nicotine more quickly and in larger quantity than a combustible cigarette (Physicians for Smoke Free Canada 2020). A laboratory study of the nicotine delivery of JUUL and JUUL-like devices concluded that the 'de-freebasing' of nicotine in these products have likely made them 'vastly more addictive for never-smokers' (Duell et al 2019).

Other studies indicate that vapers are able to get as much or more nicotine than what is obtained from a combustible cigarette in 10 puffs of their e-cigarette with both, low power / high nicotine and high power / low nicotine concentrations (Hiler et al., 2017; Wagener et al., 2016). New devices such as the JUUL and similar pod-based devices deliver nicotine even more effectively with lower power settings than advanced generation highly powered tank devices and have nicotine concentrations 2 to 10 times higher than traditional e-cigarettes (Barrington-Trimis & Leventhal, 2018). There have been no studies published on the development of dependence among pod-based device users, although one study indicates that 80% of young people who have ever tried a JUUL continue using (Willett et al., 2018).

Physicians for Smoke Free Canada (2020) provides an excellent overview of the chemical process by which organic acids are added to free-base nicotine to create protonated nicotine which facilitates inhalation of high nicotine concentrations. This report notes:

This patented formulation quickly delivered nicotine to the blood and in larger quantity than a Pall Mall cigarette, as shown in the figure above⁸. This nicotine "kick" was achieved using a nicotine concentration of 4%, less than the 5% concentration most commonly sold... JUUL was the first e-cigarette brand to use nicotine salts, but other manufacturers have quickly copied JUUL, and achieved similar results. Imperial Tobacco Canada, a subsidiary of British-American Tobacco (BAT) sells Vype ePen 3 and ePod. These products are similarly designed to JUUL but use lactic acid instead of benzoic acid to generate nicotine salts.

Duell et al (2019) studied the nicotine delivery of several e-cigarette brands. They conclude that additives that create protonated nicotine make 'e-cigarette products vastly more addictive for never-smokers' similar to how additives in the past made air-cured tobacco more inhalable for

cigarette smokers. The authors note also suggest that protonated nicotine makes e-cigarettes more effective for switching smokers from combustible cigarettes to e-cigarettes.

Research Evidence Regarding Dependence on E-Cigarettes

Based on a review of 25 epidemiological, laboratory and clinical studies, NASEM (2018) concluded that “*There is substantial evidence that e-cigarette use results in symptoms of dependence on e-cigarettes*” (NASEM, 2018; Conclusion 8-1, p. 18). The report notes, “There are several supportive findings from good-quality observational studies with very few or no credible opposing findings that (1) dependence symptoms are of appreciable prevalence or severity or higher in epidemiological studies of users; and (2) greater frequency or chronicity of use is associated with greater likelihood or severity of dependence symptoms.”

For example, a cross-sectional study using the 2012-2013 National Adult Tobacco Smoking Survey found that daily e-cigarette use was associated with dependence symptoms: 46% reported vaping within 30 minutes of waking, 46% reported symptoms of craving and need to vape, and 23% reported symptoms of craving (Rostron, Schroeder, & Ambrose, 2016).

Since the NASEM Report, further, cross-sectional studies that have used alternative measures of dependence like the PROMIS-E and the Penn State Electronic Cigarette Dependence Index also have found that increased dependence symptoms are associated with daily vaping, use of nicotine e-cigarette liquids and current smoking (Morean et al., 2018a). Symptoms of dependence have been reported in a cross-sectional study of American adolescent e-cigarette users which found that higher levels of dependence were associated with older age, longer duration of use, greater vaping frequency, higher nicotine concentrations, and current cigarette smoking (Morean, Krishnan-Sarin, & O’Malley, 2018b). An additional study of 2,891 adolescent in Texas found that e-cigarette users report symptoms of dependence specific to e-cigarettes (Case et al 2018). And, Vogel et al (2019), confirmed a strong association between e-cigarette dependence symptoms and cotinine levels in a study of 173 adolescent e-cigarette users in the San Francisco Bay area. A newer study of 12th graders in Los Angeles found dependence symptoms to predict continued e-cigarette use after six months (Vogel et al 2020).

By way of contrast, studies from the UK show that dependence may not be of grave concern, with one study that conducted five large-scale surveys between 2015 and 2017 across the UK suggesting that youth between the ages of 11 and 16 that experiment with e-cigarette use do not become regular users (Bauld et al, 2017).

A recent study of 1,000 Canadian youth and young adults conducted at the Ontario Tobacco Research Unit study demonstrates that more than half of regular e-cigarette using youth and young adults perceive themselves as addicted to vaping (Camara-Medeiros et al 2020). Additionally, it identifies that vaping daily, having initiated vaping more than one year ago, using higher nicotine concentrations and reading blogs and websites about vaping are associated with increased odds of perceived addiction.

It is important to note that youth who vape misperceive the powerfully addictive nature of nicotine and are unaware of the increased risk they face for a lifetime of nicotine addiction and cigarette use. Several studies indicate low levels of awareness of the potential harms of nicotine and of e-cigarettes (Brose et al., 2015; Yong et al., 2016; East et al 2018)

The 2019 Canadian Nicotine and Tobacco Survey found differences between vapers and non-vapers in perceived harms of e-cigarettes relative to cigarettes: “Among those who had vaped in the 30 days preceding the survey, 60% believed that vaping products were less harmful than cigarettes, 20% thought that they were similarly harmful, 9% felt they were more harmful, and 10% said that they did not know. By contrast, among those who had never vaped, 13% perceived vaping as less harmful than cigarettes, 33% felt both were equally harmful, 23% thought that vaping was more harmful, and close to one-third (31%) did not know” (Statistics Canada 2019).

Conceptual Framework for Association Between E-Cigarette Use and Cigarette Smoking

The NASEM (2018) report provides a detailed framework for understanding the potential association between e-cigarette use and cigarette smoking. In this framework e-cigarettes could have: 1) a preventive effect in which youth who would otherwise have become smokers become

attracted to e-cigarettes instead; 2) an increased risk effect in which youth who would not otherwise become cigarettes smokers are attracted to e-cigarettes because of their aesthetic characteristics and their perceived harmlessness. Once becoming e-cigarette users, these youth may be at risk of smoking cigarettes to further explore nicotine and smoking sensations and for social reasons; 3) no effect.

Research Evidence on Association Between E-Cigarette Use and Cigarette Smoking

NASEM's review of evidence on the association between e-cigarette use and cigarette smoking led to two conclusions:

Conclusion 16-1. There is substantial evidence that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.

Conclusion 16-2. Among youth and young adult e-cigarette users who ever use combustible tobacco cigarettes, there is moderate evidence that e-cigarette use increases the frequency and intensity of subsequent combustible tobacco cigarette smoking.

A systematic search conducted at the Ontario Tobacco Research Unit in 2020 (forthcoming), yielded 24 longitudinal studies and one meta-analysis of 9 studies (Soneji et al 2018) that documented future smoking among cigarette-naïve youths and young adults who vaped. While two of these studies suggested vaping did not predict any form of later cigarette use, (Selya et al 2017; Wills et al 2016) the remaining 23 studies revealed a positive association. Notably, the greatest effect was seen in Scotland, where ever use of e-cigarettes was associated with nearly 12-fold higher odds of smoking in the next 6 months (adjusted odds ratio [AOR] 11.89; 95% confidence interval [CI] 3.56-39.72) (Best et al 2017). The most recent investigation conducted in 2019 found ever vaping American youths had 4-times the odds of trying a cigarette in the next two years (AOR 4.09; 95% CI 2.97-5.63) (Berry et al 2019). Of note are two Canadian studies both of which found positive associations between e-cigarette use and cigarette smoking initiation (Aleyan et al 2018; Hammond et al 2019).

Jurisdictional Scan of Regulatory Policies Relevant to Dependence and Association with Smoking

A wide range of regulatory policies influence the likelihood of non-smokers initiating e-cigarette use and subsequently becoming dependent and/or initiating cigarette smoking. These include: sales bans; age limitations, flavour restrictions, nicotine concentration restrictions, product regulations, taxation, marketing/promotion bans and retail restrictions. This report focuses on those regulatory policy options most directly related to development of dependence: sales bans, nicotine concentrations and product regulations. Other reports will focus specifically on flavour regulations, marketing/promotion and other regulatory policy measures.

Many jurisdictions have regulations in place that are less directly related to dependence, but would still affect it, such as age restrictions, advertising and promotion restrictions, and tax requirements. With the exception of Belgium that has a minimum age of purchase or sale provision of 16 years old, 36 countries have e-cigarette purchasing age requirements that are equivalent to their cigarette requirements.¹ 13 countries have some form of taxation framework attached to the sale of e-cigarettes.² Furthermore, e-cigarette marketing is regulated in a vast number of jurisdictions, with 69 countries having rules related to this policy domain.³

Regulations often vary widely within countries. In the United States, for example, though only the federal government can place regulations on the manufacturing of tobacco products, states have the ability to regulate how tobacco products are sold and used. Various American states and municipalities have enacted e-cigarette regulations, including applying excise taxes to the purchase price, incorporating e-cigarettes into smoke-free-air laws, adding point-of-sale restrictions, and raising the minimum purchasing age to 21 years.

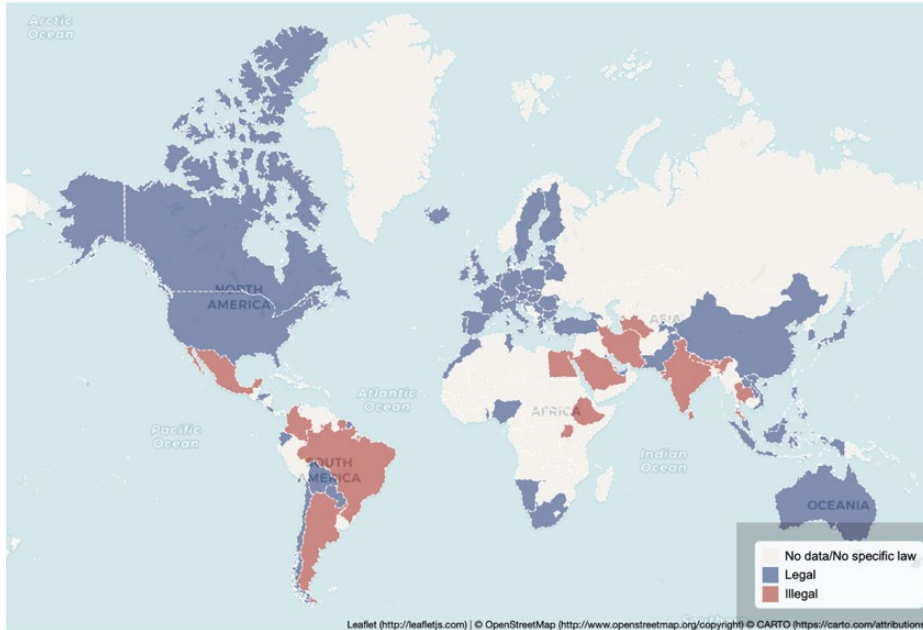
¹ For details: <https://www.globaltobaccocontrol.org/e-cigarette/minimum-age>

² For details: <https://www.globaltobaccocontrol.org/e-cigarette/tax>.

³ For details: <https://www.globaltobaccocontrol.org/e-cigarette/advertising-promotion-and-sponsorship>. Last updated February 12, 2020.

Variability in Regulation

Figure 1: Global State of Tobacco Harm Reduction, 2020



Source: Global State of Tobacco Harm Reduction 2020.

Figure 1 categorizes the spectrum of e-cigarette sale-related regulations around the world, highlighting the range of options that are currently in place from prohibition to more atypical rules. Outlined in more detail in Table 1, sales regulations can be separated into outright bans, bans on harmful ingredients, and/or regulations on quality of nicotine and/or safety.

Table 1: Sales Regulations

Policy	Country
Ban e-cigarette sales outright	Argentina, Brazil, Brunei Darussalam, Cambodia, Colombia, Egypt, Gambia, India, Iran, Kuwait, Lebanon, Mexico, Mauritius, Nepal, Nicaragua, Oman, Panama, Qatar, Seychelles, Singapore, Sri Lanka, Suriname, Syrian Arab Republic, Thailand, Timor-Leste, Turkey, Turkmenistan, Uganda, and Uruguay
Regulations around sale, such as marketing authorization requirement, cross-border sale restrictions/regulations, restrictions in venues where they can be sold etc.	Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, England, Estonia, Fiji, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malaysia, Maldives, Malta, Moldova, Netherlands, New Zealand, Northern Ireland, Norway, Palau, Philippines, Poland, Portugal, Romania, Scotland, Slovakia, Slovenia, Spain, Sweden, Tajikistan, United States, Venezuela and Wales
Ban on all nicotine-containing e-cigarettes	Australia, Jamaica, Japan, Mexico, Sri Lanka and Switzerland

Product regulations, in turn, include the amount of nicotine in e-liquids, bans of ingredients that pose a risk to human health, and regulations on quality of nicotine. Countries may have none, some, or all of these regulations, as noted in Table 2.

Table 2: Product Regulations

Policy	Country
Regulation of amount of nicotine in e-liquids	Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Netherlands, Northern Ireland, Poland, Portugal, Romania, Saudi Arabia, Scotland, Slovakia, Slovenia, Spain, Sweden and Wales
Ban of ingredients that pose a risk to human health in heated or unheated form	Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Netherlands, Northern Ireland, Poland, Portugal, Romania, Scotland, Slovakia, Slovenia, Spain, Sweden and Wales
Regulations on quality of nicotine; and/or require products to pass safety and quality evaluations	Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Netherlands, Northern Ireland, Poland, Portugal, Romania, Saudi Arabia, Scotland, Slovakia, Slovenia, Spain, Sweden and Wales

As noted, e-cigarette dependence regulations vary widely by country. Table 3 provides an overview of regulations across various countries and the European Union.

Table 3: Overview of Regulations Across Various Countries and the European Union

Country	Policy Summary
Canada	<p>The Vaping Products Labelling and Packaging Regulations under Canada’s <i>Tobacco and Vaping Products Act</i> require vaping products to not exceed nicotine concentrations of 66 mg/ml. Health Canada notes that submissions with comments from various public health organizations, health care professionals, researchers, and respondents from the general public were made regarding these regulations and urged further restrictions of nicotine concentration, including suggestions to harmonize with the Directive. However, it has chosen not to modify the requirements and based the current limit on “a peer-reviewed toxicity evaluation of the ingestion of pure nicotine”. It may, however, consider further limiting concentration levels in the future for other reasons unrelated to ingestion toxicity.</p> <p>At the provincial level, three provinces have declared regulations to limit nicotine concentrations to 20 mg/ml – British Columbia, Nova Scotia, and Ontario (for non adult stores).</p> <p>E-cigarettes (regardless of nicotine content) are regulated as vaping products under the <i>Tobacco and Vaping Products Act</i> (TVPA). They are also subject to either the <i>Food and Drugs Act</i> (FDA) or the <i>Canada Consumer Products Safety Act</i>, depending on the presence of therapeutic claims.</p> <p>Manufacturers must obtain marketing authorization from Health Canada prior to sale.</p>

Country	Policy Summary
	<p>Under the TVPA, marketing and sale of e-cigarettes that contain certain additives (such as amino acids, caffeine, coloring agents, essential fatty acids, glucuronolactone, probiotics, taurine, vitamins and mineral nutrients) is prohibited. There are also restrictions on the marketing of flavours used in vaping liquids where there are mentions or indications that appeal to youth (including flavours suggestions like confectionery, dessert, cannabis, soft drink and energy drink).</p> <p>E-cigarette packaging must display the necessary information on emissions, health hazards, and health effects as required by regulation (currently under development).</p> <p>Canada limits the amount of nicotine to less than 66 mg/mL under the consumer safety legislation (oral toxicity)</p>
European Union	<p>E-cigarettes maybe be brought to market either as medicines or as consumer products. Those seeking medicines approval (either because they make cessation/health claims or contain nicotine above the threshold of 20 mg/mL) must obtain marketing authorization under the standard drug licensing process. So far no manufacturer has undergone this process and no e-cigarette has been licensed as a medicinal product. Those opting for regulation as consumer products are regulated by the decree of 19 May 2016 on vapor products containing nicotine.</p> <p>Regardless of nicotine content, as consumer products, e-cigarettes cannot be sold in pharmacies. They must also meet the general safety requirement under the Consumer code. Sale of both nicotine-containing and non-nicotine e-cigarettes to minors (under 18 years) is prohibited.</p> <p>Nicotine content of e-liquid must be less than or equal to 20mg/mL. E-cigarette tanks must not exceed 2mL, and volume of refill bottles must not exceed 10mL. E-liquid should not contain certain additives, and only high quality ingredients should be used in their manufacture. Except for nicotine, only ingredients that do not pose a risk to human health in heated or unheated form can be used in the nicotine-containing e-liquid. E-cigarettes must be able to deliver a dose of nicotine at a consistent level under normal conditions of use.</p> <p>Nicotine-containing e-cigarettes and refill containers should be child- and tamper-proof, protected against breakage and leakage, and have a mechanism that ensures filling without leakage. Product packaging must contain a health warning and display a list of the ingredients, the nicotine content and delivery dose, the charge number and a warning that the product must be kept out of reach of children. The health warning (“This product contains nicotine which is a highly addictive substance”, in the country’s official language(s)) must appear on 30% of each of the two largest surfaces of the unit packaging and any other packaging; must be in black Helvetica bold font on a white background; text must be centralized, and be parallel to the main text on the surface reserved for the warning. The package must not contain misleading information.</p> <p>Advertising is country-by-country, but widely restricted.</p>
India	<p>E-cigarette production, manufacture, import, export, transport, sale, and distribution is banned. The law bans the direct and indirect advertisement and promotion of e-cigarettes. While this doesn’t officially ban <i>use</i> of e-cigarettes yet, the government also plans to begin prohibiting use as well.</p>
South Korea	<p>Non-nicotine containing e-cigarettes are considered consumer products. Nicotine-containing e-cigarettes are classified as tobacco products, thus their sale is prohibited to minors (under 19 years). E-cigarette packaging and advertisements should include health warnings texts that indicate that they contain harmful substances such as tobacco-specific nitrosamines, formaldehyde, etc. Nicotine-</p>

Country	Policy Summary
	<p>containing e-cigarettes can only be featured a maximum of 10 times per magazine per year. The use of e-cigarettes is banned in public places and public transport with the exception of designated smoking areas. E-cigarette products are subject to a number of taxes and charges (national health promotion, tobacco consumption, local education, and individual consumption taxes) proportional to 1,799 won/mL (approx. \$1.53 USD) nicotine liquid; in addition there is a waste charge of 24 won/20 cartridges (approx. \$0.02 USD) and a 10% Value Added Tax (VAT).</p>
Japan	<p>Non-nicotine e-cigarettes are currently not being regulated. However, nicotine-containing e-cigarettes are classified as medicinal products and are regulated under the Japanese pharmaceutical affairs law. Marketing approval for the sale, advertisement, manufacture, importation and distribution of medicinal products must be sought under this law. No medicinal e-cigarettes have been approved. The Ministry of Health, Labor and Welfare issued a statement permitting the private importation of medicinal e-cigarettes, provided it is for private use only and the amount is less than one month supply.</p>
United States of America	<p>The US Food and Drug Administration (FDA) classifies e-cigarettes and other electronic nicotine delivery systems (ENDS) as tobacco products, except in cases when they are marketed as drugs, devices or combination products (e.g., as a therapeutic product to help people quit smoking). The US FDA regulates the sale, advertising, promotion, distribution, manufacture, import, packaging and labeling of e-cigarettes classified as tobacco products based on the laws set forth in the <i>Tobacco Control Act</i> and the <i>Food, Drug, and Cosmetic Act</i> (FD&C Act).</p> <p>Any person involved in making, modifying, mixing, manufacturing, fabricating, assembling, processing, labeling, repacking, relabeling or importing e-cigarettes for sale or distribution in the United States is considered a tobacco product manufacturer and must comply with a range of provisions including submitting tobacco product marketing applications, reporting, registration, ingredient listing, and including required warnings on packaging and advertisements.</p> <p>Packaging and advertisements of e-cigarettes must bear the following warning statement: “WARNING: This product contains nicotine. Nicotine is an addictive chemical.” For e-cigarettes that are made or derived from tobacco but do not contain nicotine, the alternative statement, “This product is made from tobacco” should be placed on packaging and advertisements.</p> <p>Sale to minors (under 18 years) is prohibited. Retailers must verify age of customers under 27 years (via photo identification) before sale can be made. Sale via vending machine is restricted to adult-only facilities.</p> <p>Promotion through giving away of free samples is prohibited.</p> <p>E-cigarettes imported into the US must comply with specified requirements under the <i>Federal Food, Drug, and Cosmetic Act</i>.</p> <p>The <i>Child Nicotine Poisoning Prevention Act</i> of 2015 requires child-resistant packaging for nicotine-containing e-liquid containers.</p> <p>State Regulations:</p> <ul style="list-style-type: none"> • Indiana prohibits nicotine concentration with a maximum permitted amount of 75 mg/ml • Massachusetts - sale of electronic nicotine delivery systems with nicotine content greater than 35 mg/ml restricted to specialty tobacco stores and smoking bars; Sale/distribution of flavored

Country	Policy Summary
	<p>tobacco products or tobacco product flavor enhancers restricted to sales by a smoking bar for on-site consumption and sales of flavored electronic nicotine delivery devices to out-of-state purchaser</p> <ul style="list-style-type: none"> Utah prohibits the sale of e-cigarette substance concentrations that are higher than 24 mg/ml.

Evaluation of Regulatory Policies Relevant to Dependence

Little research has been published on the effectiveness of any of the direct dependence oriented regulatory policies. Two studies examined availability of different nicotine concentrations and compliance with EU stipulations.

Goniewicz et al (2015) found that nicotine levels in e-liquids vary widely across jurisdictions, with one study showing the upper end of the average nicotine concentration in US products to be 36.6 mg/ml, but 150.3 in South Korea and 24.7 in Poland, and significant discrepancy between the amount of nicotine concentration noted on the label of these devices compared to the actual concentrations found within the e-liquids when analyzed. Girvalaki et al (2019) reviewed compliance levels of e-cigarette liquids from the five top-selling companies in nine EU Member States. In these countries, the Directive's requirement of a maximum of 10 ml in volume for refill containers was adhered to in 86.9% of products in early 2016, increasing to 94.4% compliance in early 2018, shortly after the Directive came into force. The same study found compliance with the 20 mg/ml limit on nicotine concentration to be 100% in 2018 – up from 97% in 2016.

Recognizing the difficulty of regulating the inhalation of nicotine by e-cigarette users, researchers have noted the disadvantage to the Directive's nicotine concentration limitation - and presumably other similar caps in other jurisdictions - highlighting the possibility of increased inhalation to compensate for the lower intake of nicotine (Kośmider et al, 2017). In one study, for example, users who had purchased e-cigarettes that had significantly lower nicotine concentration levels consumed more e-liquid to compensate, equaling the total quantity of nicotine to that of other users that had used e-cigarettes with higher nicotine concentrations (Smets et al, 2019). This points to the need for not just regulation of nicotine concentration levels, but also of the e-cigarette devices to allow for suitable levels of nicotine exposure to users.

Discussion

E-cigarettes are and will likely continue to be available for sale in Canadian jurisdictions in consideration of their potential as a combustible cigarette cessation support and for harm reduction. There is broad consensus that young people, who do not or would not otherwise smoke combustible cigarettes, should not use e-cigarettes so as not to become addicted and so as to avoid respiratory, cardiovascular and other potential health harms. Yet, the regulatory approaches adopted to date by Canadian jurisdictions has failed to prevent young people from becoming regular users of e-cigarettes and becoming dependent on them.

There are a range of regulatory policies regarding e-cigarette devices and liquids that could curtail development of dependence and possible uptake of smoking by young non-smokers (Table 4). In considering which regulatory policy options to pursue, it is important to consider their likely effects on young non-smokers as well as on the overall use of nicotine and potential of e-cigarettes to support smokers in quitting and harm reduction.

Table 4: Regulatory Policy Options and Assessment Criteria

		Effect on nicotine use by youth and adults	Technical Feasibility	Political Viability	Alignment with international trade obligations
Sales regulations	Ban e-cigarette sales outright				
	Ban recreational sales / restrict to medicinal use				
E-liquid regulations	Ban nicotine e-cigarettes				
	Limit nicotine concentration				
	Limit size of cartridges/refills				
	Prohibit protonated nicotine / Ban additives that facilitate inhalation				
E-cigarette mechanism regulations	Limit power (heat)				
	Regulate length of puff				
	Allow only closed systems				

Sales Regulations

Ban E-Cigarette Sales Outright

Effects: Twenty-nine countries, including Argentina and Brazil, have banned e-cigarette sales. Effects on overall nicotine consumption have not been directly evaluated. There have been no direct comparisons of changes in the prevalence of combustible cigarette use, initiation and cessation between countries that ban and do not ban e-cigarette sales outright.

Technical Feasibility: Enforcement of outright prohibition of e-cigarette sales faces challenges of illicit market activities, particularly in jurisdictions which have allowed such sales until now.

Political Viability: Outright prohibition of substances flows against the current of legalization of cannabis and increasing support for legalization of other substances. Further arguments against prohibition of e-cigarettes come from tobacco control leaders who argue that e-cigarettes should not be prohibited while combustible cigarettes are not.

Alignment with International Trade Obligations: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard (World Trade Organization 2018). Restrictions which favour/discriminate in some categories of goods will be open to 'like product' challenge. However, In a 2017 article, Foltea and Markitanova (2017) found that e-cigarettes may be found “like” combustible cigarettes in a WTO dispute.

Ban Recreational Sales / Regulate as a Medicine

Effects: Using Singapore as a 50-year simulation model, Doan et al. (2019) found that the most effective combination of policies to simultaneously lower risk among current cigarette users while limiting initiation of e-cigarette use among non-smokers, was e-cigarettes on prescription, in combination with minimum legal age requirements and moderate tax rises. The authors

concluded that policy makers in jurisdictions in which e-cigarettes are not yet established may be advised not to prioritise e-cigarettes in their tobacco end-game strategy unless their use can be restricted to current smokers seeking to quit.

Requiring a prescription for e-cigarettes would restrict the legal market to combustible cigarette smokers. Health care professionals could prescribe e-cigarettes as a cessation support and as harm reduction. In theory, this approach would substantially reduce access to nicotine by young non-smokers. While in the UK, one e-cigarette product has been licensed to be prescribed through the National Health Service as a medicine, it is not currently available on the market and the UK also allows e-cigarettes to be sold as consumer product. In Japan, non-nicotine e-cigarettes are currently not being regulated and nicotine-containing e-cigarettes are classified as medicinal products and are regulated under the Japanese pharmaceutical affairs law. Marketing approval for the sale, advertisement, manufacture, importation and distribution of medicinal products must be sought under this law. No medicinal e-cigarettes have been approved. Something about the potential effects of regulating e-cigarettes as a medicine might be learned from the medical cannabis experience. Continued prohibition of recreational cannabis alongside allowing prescriptions for legal cannabis in Canada did not affect the prevalence of recreational cannabis use, all of which was supplied by the illicit market. It does not seem then that declaring cannabis to be a medicine affected general attitudes about using cannabis recreationally; it is possible that medicalization of cannabis further contributed to its normalization as a recreational drug. A difference between the cannabis and e-cigarette contexts is that e-cigarettes are now legally available widely for recreational use whereas cannabis was available only illicitly prior to it becoming legally available as a medicine. Considering that many young current e-cigarette users are already dependent on nicotine e-cigarettes, it is not unlikely that a thriving illicit market would emerge.

Technical Feasibility: Generally, drug approval requires considerable randomized control trial level evidence demonstrating its effects on addressing a medical problem without causing serious unintended negative consequences. This level of evidence has yet to be provided and could take some time. Alternatively, the government might waive this requirement as it did with medical cannabis. However, without due process, health care providers may be unwilling to

prescribe e-cigarettes for smoking cessation and harm reduction as has been the case for many health care providers regarding cannabis prescribing. Health care providers would want to know about counter-indications, dosage, duration, and titration protocols to feel safe in prescribing e-cigarettes. This level of evidence is not presently fully available. Moving to prohibition of recreational use from fully legal recreational use with high prevalence among non-smoking youth, many of whom are dependent would likely result in a thriving illicit market. It is not known if and how prohibiting recreational use of e-cigarettes could be effectively enforced.

Political Viability: A recent Kaiser poll showed that 49% of Americans support banning the sale of all e-cigarettes (Lopez, 2019). Given the aforementioned public attitudes about e-cigarette use by young non-smokers, there may be broad public support for prohibiting the sale of e-cigarettes for recreational use. The vaping industry which proports to be in the business of helping combustible cigarette smokers, should ostensibly be on board with regulating e-cigarettes as a medicine. However, their argument has been that a major advantage of e-cigarettes over nicotine replacement therapy is in its ability to reach massive numbers of smokers through wide availability, access, marketing, and allure as an attractive/cool alternative to combustible cigarettes. Requiring a prescription, they would argue, would negate these advantages. Prohibition of recreational cigarettes might also be open to charter claims as an impingement on freedom of commerce.

Alignment with International Trade Obligations: The same considerations listed above for sales bans apply to restricting sales of e-cigarettes for medicinal purposes.

E-Liquid Regulations

Banning and Limiting Nicotine Concentrations

Effects: Six countries, including Australia, Japan and Switzerland, allow only non-nicotine e-cigarette product sales. Prior to May 2018, this was also the case in Canada. In Canada, despite this stipulation nicotine e-cigarettes were widely available. The EU approach of limiting nicotine concentration to 20 mg/ml, seems to have become the standard that other jurisdictions, including some Canadian provinces are adopting. The only hint available of the effects of limiting nicotine concentration to 20 mg/ml is that uptake of e-cigarettes by UK youth is far lower than in

the US and Canada which have not adopted this standard. However, the UK approach to e-cigarette policy differs from the US and Canada in many other respects, including restrictions on advertising and promotion and substantial push from government health organizations of e-cigarettes for smoking cessation and harm reduction. Current evidence does not therefore make it possible to attribute differences between the UK and other countries in youth uptake of e-cigarettes to the 20 mg/ml stipulation.

Indeed, the evidence presented above suggests that the 20 mg/ml stipulation is insufficient to prevent young non-smokers from becoming dependent, to decrease the potential of e-cigarettes as an alternative to combustible cigarettes for smokers or to decrease overall population nicotine use. Even at nicotine concentrations of 20 mg/ml or less users can deliver very high doses of nicotine into their bloodstream by using high power/heat settings on their devices, by using protonated nicotine (nicotine salts), and by puffing longer and harder on the e-cigarette device.

It is therefore unclear the extent to which limiting nicotine concentration of e-cigarettes to 20 mg/ml, when implemented without other product regulation policies, changes nicotine use in e-cigarettes and in tobacco products by youth and by adults. There is a need for rigorous observational research comparing nicotine use outcomes amongst jurisdictions with and without 20 mg/ml stipulations while controlling for other variables. There is a need for real-world evaluative research on the effects of 20 mg/ml stipulations and for laboratory research on puff topography and on delivery of nicotine to the bloodstream under varying power/heat, nicotine types and nicotine devices.

Technical Feasibility: There is no technical challenge in producing nicotine concentrations at or below 20 mg/ml. Questions arise as to enforceability, as various reports have shown significant variability between reported and actual concentrations. Illicit higher nicotine concentration liquids and pods may be easy to produce and to distribute. However, this type of illicit activity has not been reported in the EU where nicotine concentration is limited to 20 mg/ml. Enforcement might be more challenging for open system e-liquids than for pods for closed systems.

Political Viability: The EU has already limited nicotine concentrations to 20 mg/ml for quite some time. The 20 mg/ml limit has not stopped England from promoting e-cigarettes for smoking cessation and harm reduction, purportedly with some success. And, three Canadian provinces are already moving toward a 20 mg/ml limit. The vaping industry and vape shops oppose these restrictions Ontario convenience store representatives have [come out firmly against restrictions](#) on selling high nicotine concentration e-cigarette products in their stores [as have other industry groups](#). Public opinion research on the other hands suggest that the general public is in favour of restrictions on nicotine concentrations. The majority (66%) of survey respondents from Earncliffe Strategy Group (2019) strongly disagreed with the statement “*I don’t see any problem with young people using vaping products with nicotine*”. Similarly, a majority of survey respondents expressed disagreement with the statement “*I don’t see any problem with young people using vaping products without nicotine*”. In comparison to youth (age 15-19), young adults, and smokers, youth (age 13-14) and non-smokers most frequently said that they strongly disagree with both statements.

Alignment with International Trade Obligations: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. (World Trade Organization 2018). 20 mg regulations are based on a somewhat international standard (EU directive) and have not been challenged. Indeed, upper limits on nicotine in e-cigarettes have been in place in the EU since 2014 and upper limits on nicotine, tar and carbon monoxide for longer. These have not been subject to complaints at the WTO TBT (Eckhardt et al 2015). Non-EU countries including Israel and Iceland have adopted this standard without concerns being raised at WTO. It is reasonable to expect that expanding these to other areas would similarly not elicit complaints.

Limit Size of Cartridges and Refills

Effects: The EU Directive has restricted cartridges to 2 ml and refill containers to 10 ml since 2014. There is no evidence about the effects on e-cigarette use by young non-smokers or by adult

smokers. Parallels from tobacco and food consumption studies suggest that restricting maximum sizes of substance packs can reduce consumption. From their 12-country study, Blackwell et al (2020) found some evidence to suggest that larger cigarette packs are associated with more cigarette consumption. A Cochrane systematic review found that food and soft-drink portion size had a small to moderate effect on consumption but found insufficient evidence for alcohol or tobacco pack sizes (Hollands et al 2014). Thus evidence about limits on maximum pack sizes is suggestive, but weak and the effect of limits on e-cigarette cartridges and refill containers is unknown.

Technical Feasibility: No challenges have been reported with producing limited sized cartridges and refill containers in the EU. Nor have there been any reports regarding enforceability challenges or of compliance.

Political Viability: The EU has already limited cartridge and refill container sizes for quite some time setting a precedent for other jurisdictions. The vaping industry and Canadian vape shops may oppose these limitations while public health organizations and the general public are likely to be in favour. Laboratory studies and real-world observational evaluative research comparing jurisdictions that limits on the size of e-cigarette cartridges and refills with those that do not is needed to inform regulatory decisions on this matter.

Alignment with International Trade Obligations: There are no international standards on product design. Product restrictions which favour/discriminate in some categories of goods will be open to 'like product' challenge. Because there is no international standard for vaping products and because vaping regulations may have an effect on trade, Canada is obliged to provide TBT notification of vaping regulations. Because the regulations are aimed at the legitimate objective of protecting health and will not be more trade-restrictive than necessary, they are unlikely to be opposed.

Prohibit Protonated Nicotine/ Ban Additives that Facilitate Inhalation

Effects: Two countries – France and Iceland – prohibit additives to e-cigarette products that facilitate inhalation. Nevertheless, nicotine salts are still sold in France and there is no evidence available on enforcement or results of restrictions in Iceland. Laboratory studies, reported above, demonstrate that lactic acid and other such additives that create nicotine salts allow for

high nicotine concentrations to be palatable and for quick and effective effects on the flow of nicotine in the bloodstream to the brain. Even prior to the introduction of protonated nicotine in e-cigarettes, there was considerable evidence that e-cigarette use was associated with dependence. Yet, since the introduction of protonated nicotine e-cigarette products, use by young non-smokers has increased dramatically and currently a large majority use protonated nicotine with the JUUL brand commanding the largest market share. To assess the effects on youth e-cigarette use of prohibiting protonated nicotine, economic choice and modelling studies as well as real-world evaluations of experience in places such as Iceland should be conducted. It is currently not known whether protonated nicotine products are more effective than free-base nicotine products or are necessary for adult smoking cessation and harm reduction. The RCT studies on e-cigarette use for cessation published to date have all been with free-based nicotine. Further experimental and observational research on the real-world effects on combustible cigarette smokers wanting to switch or quit by using e-cigarettes is needed.

Technical Feasibility: The main technical feasibility issue might be around enforcement of a ban on protonated nicotine. It may prove particularly challenging to prevent the sale of protonated nicotine liquids for use in refilling open system e-cigarettes. The nicotine pods in closed system e-cigarettes are closed in the factory and cannot be manipulated by users. It would therefore likely be easier to enforce protonated nicotine restrictions for closed system e-cigarettes. The likelihood of the development of an illicit market for protonated nicotine pods and liquids is an unknown consideration.

Political Viability: The Vaping Industry Trade Association, and producers of pod systems that use protonated nicotine, including those owned and partially owned by tobacco companies vigorously oppose restrictions on protonated nicotine. The political considerations are similar to those noted above for limits on nicotine concentrations with the additional complication that the general public is not knowledgeable about the distinction between free-base and protonated nicotine. Ontario convenience store representatives have [come out firmly against restrictions](#) on selling high nicotine concentration e-cigarette products in their stores [as have other industry groups](#). Public opinion research (Earnscliffe 2019) summarized above on the other hands suggest that the general public would be in favour of restrictions on protonated nicotine.

Alignment with International Trade Obligations: There are no international standards on

protonated nicotine or additives that facilitate inhalation restrictions. Such restrictions which favour/discriminate in some categories of goods will be open to 'like product' challenge. Because there is no international standard for vaping products and because vaping regulations may have an effect on trade, Canada is obliged to provide TBT notification of vaping regulations. Because the regulations are aimed at the legitimate objective of protecting health and will not be more trade-restrictive than necessary, they are unlikely to be opposed.

E-Cigarette Device Regulations

Limit Power/Heat, Regulate Length of Puff, Allow Only Closed Systems

Effects: E-cigarette designs, heating element features, liquid contents, and user behavior all individually have limited utility as metrics of inhalation-related nicotine exposure, toxicity, and effectiveness. The utility of these individually considered features is limited because no one feature alone determines the rate at which nicotine is emitted (i.e., the flux). For instance, a high-voltage/low nicotine concentration combination may provide the same or greater flux as a low-voltage/high nicotine concentration combination. The flux, as a result, determines the effect of a given nicotine dose, ranging from no effect to acute toxicity. If the e-cigarette nicotine flux is low, users likely will abandon the device. If the flux is high (e.g., exceeds levels characteristic of combustible cigarettes), users may accept the device despite the fact that it carries with it the potential for toxic side effects (Shihadeh & Eissenberg, 2014).

Even at nicotine concentrations of 20 mg/ml or less users can deliver very high doses of nicotine into their bloodstream by using high power/heat settings on their devices. Doubling power approximately triples nicotine yield (Talih et al., 2014) and, not surprisingly, increasing power also increases nicotine delivery to blood (Yingst et al., 2019). As users might compensate for limited power by taking longer puffs, restrictions on power/heat might be accompanied by requiring that devices have a mechanism that automatically shuts off after x seconds of a puff. Restricting devices to closed systems with heat and puff limitations set at the factory would facilitate power/heat and puff length stipulations. To limit the dependence risk, policymakers could consider prohibiting e-cigarette devices that allow for high power/heat. Limits on power/heat are not currently in place in any jurisdiction that we are aware of. Evidence from

laboratory studies on nicotine yield (Talih et al 2014, Yingst et al 2019) at higher power suggest that limiting power might decrease the dependence risk for young non-smokers. More research is needed to better understand how power / nicotine concentration combinations standards might affect e-cigarette use by young non-smokers and to offer a potential alternative for combustible cigarette smokers.

Technical Feasibility: Currently, power/heat in some advanced open system e-cigarettes can be manipulated by users either by design or through tinkering. It may prove challenging to prevent power/heat and puff duration manipulation in open system e-cigarettes. The power/heat and puff duration settings in closed system e-cigarettes can be set in the factory and not be manipulatable by users. It would therefore likely be easier to enforce power/heat and puff duration standards for closed system e-cigarettes. The likelihood of the development of an illicit market for higher power/heat devices is an unknown consideration.

Political Viability: Lack of precedent from other jurisdictions restricting power/heat of e-cigarettes is a potential obstacle to adopting this measure. However, evidence from laboratory studies about the association between power/heat and delivery of nicotine to the bloodstream might make this regulatory policy option more attractive for policymakers. There would likely be opposition from the vaping industry and from vape shops and support from public health organizations and the general public.

Alignment with International Trade Obligations: There are no international standards on temperature, etc. Such product restrictions which are innovative will be open to challenges of justifiability and least restrictive. Such restrictions which favour/discriminate in some categories of goods will be open to 'like product' challenge. Because there is no international standard for vaping products and because vaping regulations may have an effect on trade, Canada is obliged to provide TBT notification of vaping regulations. Because the regulations are aimed at the legitimate objective of protecting health and will not be more trade-restrictive than necessary, they are may not to be opposed. At the same time, it is not clear how a “like product” will be determined with respect to product standards that make slight differences between products. – especially those that have the effect of prohibiting sales from some manufacturers or preferring others.

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Regulatory Policy for E-Cigarette Flavours

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Introduction

Twenty-nine percent of Canadian youth in grades 10 to 12 report past 30-day use of e-cigarettes. Forty percent of these young e-cigarette users reported daily use (Government of Canada 2019). By far, most of these young e-cigarette users were not and would not have become combustible cigarette smokers. E-cigarettes liquids are available in thousands of flavours. There is increasing attention to the role of flavours in the dramatic increases seen in Canada and other countries in e-cigarette use by young non-smokers. At the same time, flavours may play a role in attracting cigarette smokers to use e-cigarettes for cessation and harm reduction.

Learning from Tobacco Flavour and Menthol Bans

Experience from policies restricting flavours in combustible cigarettes and other tobacco products may provide important learnings for developing e-cigarette flavour regulatory policy.

Effects of Flavoured Tobacco

Research on the effects of flavours in combustible cigarettes and other tobacco products has revealed several concerns (Huang et al 2016):

1. Flavoured tobacco products tend to be perceived as healthier, more appealing and less harsh than unflavoured products
2. Use of flavoured tobacco decreases intention to quit smoking
3. Some flavours, particularly candy-flavoured and fruit-flavoured cigarettes, are appealing, especially to youth
4. Masking tobacco smoke harshness with flavours contributes to promoting and sustaining tobacco use (WHO in Huang et al 2016)
5. Flavoured products are perceived to have better aromas and after taste, and spark interest and curiosity among potential users (Carpenter et al 2005)

Regulatory Policies for Flavoured Tobacco

Jurisdictions around the world have devised regulatory policies to address these concerns. The 2010 WHO Framework Convention on Tobacco Control guidelines recommended restrictions or bans on flavours in tobacco products. Several jurisdictions have banned flavoured combustible cigarettes, excluding menthol, including the United States, the European Union (EU), Australia, Brazil and Canada. Some countries are also banning flavours in other tobacco products. The Food and Drug Administration in the USA was given the authority in 2010 to regulate flavours in tobacco, has banned flavours in cigarettes, and is considering banning or regulating flavours in other tobacco products. The European Union announced the regulation of flavours in a 2014 Tobacco Products Directive.

Effectiveness of Regulatory Policies for Flavoured Tobacco

There have been surprisingly few studies published that evaluate flavoured tobacco restrictions in terms of their implementation and effectiveness. Brown et al (2019) reviewed two studies that evaluated New York City's tobacco flavour restrictions. A 2017 study (Farley & Johns 2016) found that in light of the flavour restrictions, the prevalence of youth tobacco use decreased from 19.6% in 2010 to 15.6% in 2013. While the sale of flavoured cigars decreased by 87%, the sale of non-flavoured cigars increased by 5%. Looking at the same restrictions with a somewhat different methodology, Rogers et al (2017) found that there was no substitution effect for flavoured cigars. They found only a 22.3% decrease in flavoured cigars, but a 97.6% decrease in flavoured smokeless tobacco and 42.5% decrease in roll-your-own flavoured tobacco sales.

In 2009, the Government of Canada enacted new regulations on the sale of flavoured tobacco, banning flavour additives (except menthol) in cigarettes and all cigars under 1.4 g (or in any cigar that had a filter or non-spiral wrap). These regulations were aimed at protecting young persons from inducements to use tobacco, as emerging research had shown that over one-third of youth smokers were using flavoured cigars and cigarillos (Chaiton et al 2018).

An Ontario Tobacco Research Unit study (Chaiton et al 2018) found that the Federal flavour regulations were associated with a reduction in the sales of flavoured cigars by 59 million units

(95% CI -86.0 to -32.4). Increases in sales of cigars with descriptors other than flavours (eg, colour or other ambiguous terms) were observed (9.6 million unit increase (95% CI -1.3 to 20.5), but the overall level (decline of 49.6 million units (95% CI -73.5 to -25.8) and trend of sales of cigars (6.9 million units per quarter (95% CI -8.1 to -5.7)) declined following the ban. This study demonstrates that flavour regulations have the potential to substantially impact tobacco sales. However, exemptions for certain flavours and product types may have reduced the effectiveness of the ban, indicating the need for comprehensive, well- designed regulations.

Effects of Menthol Tobacco

Menthol is a flavouring agent added to cigarettes that masks the taste of tobacco, induces sensory effects, and recruits and retains smokers. The Food and Drug Administration (FDA) and the World Health Organization (WHO) independently examined the evidence on the health risks of menthol cigarettes. The FDA concluded that “menthol cigarettes pose a public health risk above that seen with non-menthol cigarettes” and removing them from the market would be of public health benefit (Food and Drug Administration 2013). The WHO made similar recommendations of “banning the use of menthol and its analogues, precursors or derivatives in cigarettes and possibly all tobacco products” (World Health Organization 2016).

Regulatory Policy for Menthol Flavoured Tobacco Products

Canada has implemented a national ban on menthol flavoured tobacco products. Other nations such as Brazil, Ethiopia, Turkey and the European Union have passed regulations to ban menthol tobacco products and the EU directive is to come into force May 2020.

Effectiveness of Menthol Tobacco Restrictions

An Ontario Tobacco Research unit study (Chaiton et al 2019) of Canada’s menthol tobacco ban compared the planned behaviour of menthol smokers before the ban with their actual behaviour one-month post-ban and found that a greater percentage of menthol smokers attempted to quit after the ban than had planned before the ban. Follow-up at one year found that those who were daily menthol smokers prior to the ban were more likely to attempt to quit and be quit (Chaiton et al 2019). At the one year follow up, 63% of daily menthol smokers reported making a quit

attempt since the ban compared to 62% of occasional menthol smokers and 43% of non-menthol smokers (adjusted relative risk (ARR) for daily menthol smokers compared to non-menthol smokers: 1.25; 95% CI 1.03-1.50). Daily menthol smokers were also more likely to report being abstinent after one year compared to non-menthol smokers: 1.62; 95% CI 1.08, 2.42). This suggests that the ban substantially increased quit attempts in the short duration after the ban; these results held in a two-year follow-up.

While limited in number, evaluations of regulations on flavoured (including menthol) tobacco products indicate positive results in decreasing sales of tobacco products overall, decreasing sales to minors and promoting quit attempts. Canadian data suggest that when restrictions are not comprehensive, users will substitute unrestricted flavoured products for restricted ones previously used.

E-Cigarette Flavours

Effects of E-Cigarette Flavours

The use of flavours in e-cigarettes has been associated with enticing youth users (WHO 2019). One study surveyed 13-17 year old youth and found that they were more likely to be interested in trying an e-cigarette from a friend if it were flavoured like menthol, candy, or fruit compared to tobacco, and also believed that e-cigarettes that were fruit-flavoured were less harmful than those with tobacco flavour (Pepper et al 2016). Another study found that fruit, sweets, and beverage flavours significantly increased the chances of 14-17 year old youth choosing e-cigarettes (Shang et al 2017). Youth also tend to prefer sweet flavours compared to adults (Hoffman et al 2016).

There is substantial evidence that flavoured e-cigarettes are perceived to carry less health risks than tobacco flavoured e-cigarettes. In a systematic review published in 2018, Zare et al found that sweet and fruit flavoured e-cigarettes were perceived as less harmful than tobacco flavoured ones (Zare et al 2018). A more recent study found that American youth perceive specific health risks – lung cancer, secondhand vapour harms, addiction, to be significantly greater from fruit flavour e-cigarettes in particular but also from candy, menthol/mint and alcohol flavours all in comparison with tobacco flavoured e-cigarettes (Strombotne et al 2020).

There is also some evidence that flavoured e-cigarettes are perceived to be easier to use than tobacco flavoured e-cigarettes. Chen-Sankey et al (2019) used US PATH study data from wave 1 (2013-14) and wave 2 (2014-15) to examine the effects of youth (n=6,983) perceptions of ease of use of flavoured e-cigarettes. They found that perceptions of flavoured e-cigarettes as easier to use at wave 1 “was positively associated with e-cigarette use susceptibility at wave 1 (AOR = 1.43, CI = 1.21, 1.69), and e-cigarette initiation (AOR = 1.32, CI = 1.12, 1.67) and past-30-day use (AOR = 1.25, CI = 1.10, 2.47) at wave 2”.

Laboratory studies suggest that some flavourants cause cell and respiratory system damage. Fruit flavours, popular amongst young vapers, have been associated with “greater concentrations of known inhalation irritants, diminished bronchial epithelial cell metabolic activity and viability, and increased release of pro-inflammatory cytokines” (Smith et al 2019). One study found an association of flavored e-cigarette with potential lung disease (Allen et al 2016).

A recent systematic review found that “Adolescents could consider flavor the most important factor in their decision to try e-cigarettes and were more likely to initiate vaping through flavored e-cigarettes (especially fruit and sweet ones for non-smokers)” (Zare et al 2018).

Data from several population studies indicates that very few young e-cigarette users use tobacco flavour. Popular flavours amongst youth include, fruit, candy and menthol. A recent American study found that amongst young JUUL users, mint was the most popular flavour in some grades while fruit flavours were more popular in other grades (Leventhal et al 2019). Last flavour used by Canadian youth in 2017 was fruit for 67.4%, candy for 16% and mint/menthol for 5% (CTADS 2017).

Studies indicate that adult smokers increasingly prefer fruit, menthol/mint and sweet flavoured e-cigarettes over tobacco flavoured e-cigarettes. A recent longitudinal study of 383 American adults (between 2012-14 and 2017-19) found that, “Preference for tobacco and menthol or mint decreased over time (40% baseline, 22% follow-up); preference for fruit remained stable (23% baseline and follow-up), but chocolate/candy or other sweets preference significantly increased (16% baseline, 29% follow-up) and other flavors increased slightly” (Du et al 2020).

Preferences of adults for flavoured e-cigarettes does not, however necessarily indicate that they are more effective than tobacco flavoured cigarettes for switching from combustible cigarettes to e-cigarettes. A systematic review did not find conclusive evidence of flavoured e-cigarettes contributing to smoking cessation (Zare et al 2018).

Jurisdictional Scan of Regulatory Policies Related to Flavours of E-Cigarettes

The World Health Organization recommends countries apply bans on flavouring of e-cigarettes to deter use by youth (WHO, 2019). Jurisdictions around the world regulate e-cigarettes differently, with some banning all flavours, and others banning a subset, or not banning any at all.

The European Union (EU)

The Tobacco Products Directive does not require member states to regulate e-cigarette flavours. Its preamble notes that regulating flavours could be useful and that prohibitions would require justification. In 2016, Finland banned e-cigarette flavours in both nicotine and non-nicotine e-liquids (Ollila 2019). A number of countries, including Estonia and Denmark, have tabled legislation to ban e-flavours.

This contrasts with the EU's Tobacco Products Directive ([2014/40/EU](#)) (Directive), that Member States are bound by rules that regulate the manufacturing, presentation, and sale of tobacco and other related products including e-cigarettes. Under Article 7 of the Directive, Member States are prohibited from placing tobacco products with a characterising flavour on the market. A characterising flavour means “a clearly noticeable smell or taste other than one of tobacco, resulting from an additive or a combination of additives, including, but not limited to, fruit, spice, herbs, alcohol, candy, menthol or vanilla, which is noticeable before or during the consumption of the tobacco product” (Directive, Article 2(25)). This includes any additives that impart a smell and/or taste. The Directive mentions concerns of characterising flavours potentially facilitating the initiation of tobacco consumption or affecting consumption patterns.

The New Zealand government is developing legislation that would only allow three flavours: tobacco, menthol, and mint. Notably, New Zealand legislators have also identified the *names* of flavours as a key element to regulate. Flavour names, such as Honey Bear, Tropical Bomb and Good Morning Sunshine, appear intentionally directed towards youth.

The United States (US)

Nine US states regulate the flavours that can be used in e-cigarettes (Public Health Law Center 2020a):

Table 1: Flavour Bans in US States

State	Law
Massachusetts	In November 2019, Massachusetts became the first state to restrict the sale of all flavored tobacco products, including menthol cigarettes. The policy goes into effect June 1, 2020, with the exception of flavored e-cigarettes, which were banned immediately (they had already temporarily been banned per an emergency order issued 9/24/19)
Michigan	The sale of flavoured e-cigarettes is prohibited.
Montana	The sale and distribution of flavoured e-cigarettes is prohibited.
New Jersey	In January 2020, New Jersey enacted legislation banning the sale of all flavored e-cigarettes. Effective 4/20/20.
New York	The possession, manufacturing, distribution, and sale of all flavoured e-cigarettes is banned.
North Dakota	The sale and distribution of flavoured e-cigarettes to individuals under the age of 18 is prohibited.
Oregon	The sale of flavoured e-cigarettes is prohibited. [The state banned e-cigarettes for six months.]
Rhode Island	The sale of flavoured e-cigarettes is prohibited.
Washington	The sale of e-cigarettes that contain vitamin E acetate, flavours, and products reasonably known to be used to flavour vapor products is prohibited.

In early 2020, the Food and Drug Administration released its [enforcement policy](#) aimed at unauthorized flavoured cartridge-based e-cigarettes that appeal to youth, including fruit and mint flavours (US Food and Drug Administration 2020b). This enforcement policy, not an actual ban, aims at fruit, candy, mint and dessert flavors from small, cartridge-based e-cigarettes. It does not apply to menthol and tobacco-flavours and it does not apply to large, tank-based vaping devices. Companies that violate the policy by continuing to manufacture, distribute, or sell these products may be at risk of FDA enforcement actions.

Over 260 localities in the United States have prohibited the sale of flavoured tobacco products, including:

- Berkeley, Oakland, Sacramento and San Francisco in California
- Aspen, Colorado
- Chicago, Illinois
- Boston, Massachusetts
- Minneapolis and St. Paul in Minnesota
- Providence, Rhode Island

Further reference: <https://www.tobaccofreekids.org/assets/factsheets/0398.pdf>.

Canada

Federal legislation bans the promotion or labelling of confectionary, dessert, cannabis, soft drink and energy drink flavours, but not the actual flavours themselves. Under Canada's *Tobacco and Vaping Products Act* it is illegal to advertise vaping products' flavours that could appeal to youth. Health Canada, when announcing draft new e-cigarette promotion regulations, also stated in a Dec. 19, 2019 news release that "additional measures with respect to [...] additional flavour restrictions are being examined".

Several provinces and territories have suggested or imposed stricter restrictions on flavoured e-cigarettes:

In Nova Scotia, on December 5, 2019, the Nova Scotia Government announced regulations to ban the sale of flavoured vaping products (except tobacco flavour) effective April 1, 2020 (a first in Canada).

PEI, as of March 1, 2020, established regulatory authority to restrict flavours in e-cigarettes.

In British Columbia, on April 11, 2019, Liberal MLA Todd Stone introduced a private member's bill, Bill 210, that includes a ban on flavours for e-cigarettes. On Nov. 14, 2019, the provincial government announced that it would move forward with a series of measures to reduce youth vaping including banning the sale of flavoured e-cigarettes except in adult-only premises and banning the sale of certain youth appealing flavours.

In Ontario, on Feb. 28, 2020, the provincial government released draft regulations to require that most flavoured e-cigarettes only be sold in specialty vape stores, and not convenience stores, gas stations, grocery stores and other such stores, now effective July 1, 2020 (however, e-cigarettes with tobacco, mint and menthol flavours will still be able to sold in stores other than specialty vape stores).

In Alberta, on October 25, 2019, the provincial government announced that it would be conducting a review of provincial legislation regarding tobacco and e-cigarette measures, to be completed by Christmas 2019, with legislation to be introduced in Spring 2020. The review was led by Conservative MLA Jeremy Nixon. On Feb. 26, 2020, the Alberta Government indicated in the Throne Speech that it would introduce legislation “to protect minors from risks associated with vaping.”

Saskatchewan (Bill 182, third reading Nov. 6, 2019), Yukon (Bill 3, third reading Oct. 17, 2019) and Northwest Territories (Bills 40, 41, third reading Aug. 13, 2019) established regulatory authority to restrict flavours. The Saskatchewan legislation came into force Feb. 1, 2020. The Yukon legislation came into force March 5, 2020. The Northwest Territories legislation came into force March 31, 2020.

In Quebec, on Nov. 25, 2019, Health Minister Danielle McCann announced the establishment of a new special task force to provide recommendations by April 2020 on tobacco and e-cigarettes. The mandate of the group includes looking at flavours. A La Presse article regarding the announcement indicated that the Quebec government is also intending a type of medical authorization in order for an individual to purchase e-cigarettes, or at least some e-cigarettes.

In Nunavut, on Feb. 5, 2020, the territorial government announced consultations a variety of e-cigarette measures, including prohibiting flavoured products.

Other Jurisdictions

Some countries outside of the EU, US, and Canada have also taken steps to regulate flavoured e-cigarettes. For example, Moldova (Global Tobacco Control 2019) and Bermuda (Tobacco Control Laws 2019) ban flavours. States and territories in New Zealand ban fruit and confectionary

flavoured e-cigarettes (Tobacco Control Laws 2019). This is consistent with findings that flavours like confectionary may discourage vaping uptake among non-smokers while having relatively little effect on smokers' willingness to switch to vaping (Gendall and Hoek 2020).

Regulatory Approaches

Varying regulatory approaches to flavoured e-cigarettes exist:

Table 2: Levels of Flavour Restrictions by Jurisdiction

Level of Restriction	Jurisdiction
Minor restrictions	British Columbia, Canada North Dakota, US Northwest Territories, Canada Ontario, Canada Saskatchewan, Canada Yukon, Canada
Major restrictions	Michigan, US Montana, US New York, US Oregon, US Rhode Island, US Washington, US
Comprehensive restrictions	EU Member States Massachusetts, US New Jersey, US Nova Scotia, Canada

Effects of E-Cigarette Flavour Regulations

Few studies have evaluated e-cigarette flavour restrictions. Assessment of their likely effects on decreasing e-cigarette use by young non-smokers and on decreasing e-cigarette use by smokers for cessation and for harm reduction must rely, for now, on extrapolating from restrictions on flavours in cigarettes and other tobacco products. Two studies have examined the effects of JUUL's voluntary flavour restrictions:

JUUL reported no loss in sales after it eliminated all flavours except tobacco and menthol (Liber et al 2020). After a loss in sales following JUUL's decision to withdraw most flavored products from stores, JUUL sales recovered within weeks and surpassed their previous maximum in the

same categories, as consumption simply switched to the menthol/mint and tobacco flavors that had not been banned. Additionally, many other companies took up the non-menthol flavoured market once JUUL abandoned it, signalling a need for more comprehensive, industry-wide regulation.

The JUUL flavour ban, overall, had mixed results: five months after JUUL abandoned fruit flavored pods, Tackett et al (2020)'s study found that among youth who had tried JUUL, only 28% signalled that the flavor restrictions had affected their use; of those, 46% stopped using JUUL, 27% changed their purchasing behavior to either obtain pods online or use non-JUUL branded pods, and 25% switched to a mint or tobacco flavor.

Discussion

In deciding which e-cigarette flavour policy option to adopt, policymakers face a tension between wanting to prevent e-cigarette use by non-smoking youth and facilitating e-cigarette use for cessation and harm reduction by adults who smoke combustible cigarettes. Table 3 outlines seven major policy options for regulating e-cigarette flavours along with criteria for their assessment. Each policy option is analyzed using each of these criteria.

Table 3: Major Policy Options for Regulating E-Cigarette Flavours and Criteria for Assessment

	Effect on nicotine e-cigarette use by youth and adults	Technical Feasibility	Political Viability	Alignment with international trade obligations
a) Ban all flavours including menthol				
b) Ban flavours excluding menthol				
c) Ban flavours with additional exceptions (e.g. fruit + menthol)				
d) Ban flavours (as in a, b, c) in closed systems only				
e) Restrict flavours (as in a,b,c) to adult stores only				
f) Allow flavours only in medicinal products available to smokers				
g) Allow all flavours				

Ban All Flavours Including Menthol

Effects: The most comprehensive policy option would be to ban all flavours, including menthol, in all types of e-cigarettes and in all retail venues. There is research evidence, presented above, indicating that many smokers are and might be attracted to e-cigarettes because of flavours. There is substantial evidence that flavours are highly important in youth initiation of e-cigarette use and there is evidence that restrictions on flavours in combustible cigarette products has led to decreased use. At the same time, it is not known definitively what proportion of smokers who would otherwise try, continue to use e-cigarettes or successfully quit smoking combustible cigarettes, would not do so in the absence of flavours. It is not known definitively what

proportion of them would not use e-cigarettes if flavours were not available. Further research would compare outcomes in real-world settings between jurisdictions that have banned all flavours and those that have not. In the absence of this kind of more definitive evidence, economic choice studies and modeling studies with sensitivity analyses could be conducted to estimate the effects of banning all flavours on the numbers of youth who would not use e-cigarettes and adults who would otherwise have quit smoking combustible cigarettes by using e-cigarettes. Notwithstanding the lack of conclusive evidence, what is known about the role of flavours in youth uptake of e-cigarettes, the rates of successful cessation of adult smokers who use e-cigarettes and lessons from tobacco flavour bans, there is a strong likelihood that banning non-tobacco e-cigarette flavours would substantially reduce overall nicotine use.

Technical Feasibility: There is some American data suggesting that many e-cigarette users would try circumventing a ban on flavoured e-cigarettes. A majority of participants in the Du et al study said that they would turn to the illicit market, make their own flavours or even revert to combustible cigarette smoking – for current and former smokers (Du et al 2020). Amongst the dangers of illicit flavoured e-liquids are toxicities perhaps not unlike those being revealed in EVALI cases. Fighting an illicit market for flavoured e-liquids is likely a substantial challenge.

Political Viability: A recent survey found a majority of Canadians want stricter regulations on vaping flavours: 57% of Canadians believe that flavoured vaping products should be outright banned (Research Co. 2019). Similarly, a survey from the Angus Reid Institute showed that 60% of Canadians agree that banning flavoured vaping products is a good idea (Angus Reid 2020). More than eight in ten (82%) participants supported restricting flavoured vaping products to adult-only stores (Angus Reid 2020). Support in the US for banning e-cigarette flavours is somewhat lower – 40% according to one study (Du et al 2020).

Not surprisingly, there is strong industry opposition to bans on e-cigarette flavours. One indication of this is from industry reactions to Nova Scotia's flavour ban suggesting that the ban would not affect youth e-cigarette use, that it would lead to extensive illicit market activity and that it does not take into account the use of e-cigarettes for harm reduction (Weeks 2019).

In the United States, the Trump Administration's initial announcement of intent to ban all

e-cigarette flavours led to forceful opposition from industry whose efforts included public protests and advertising campaigns as well as its own polling of flavour preferences. In response, menthol and open-system e-liquids were exempted despite opposition from the American Medical Association and other health organizations (Goodnough et al 2020).

In Finland, proper regulation was hurt by the wide variety of e-cigarette products, limited resources for tobacco control to expand in scope and reluctance of the e-cigarette business to comply with the stricter regulations in Finland, resulting in court cases filed by e-cigarette businesses (Ollila 2019). Additionally, compliance was often low, complicating evaluation of results: E-cigarette devices and nicotine-free liquids were absent in grocery stores and kiosks, however the specialised e-cigarette outlets were found to still be selling flavours in 2017, circumventing the rules by not selling them in ready-made mixes with nicotine liquids. Another consideration: because manufacturers of these flavours sell them as foodstuffs, the risks are shifted to the consumers if various liquids are mixed by consumers themselves. The safety of flavours, in most cases, has been only tested for use as food additives, not when heated and vaped into the lungs (Ollila 2019).

Racial biases have been associated with bans on menthol cigarettes and might also affect attempts to regulate menthol e-cigarettes. As noted in the Washington Post, “Some black leaders say a ban on menthol cigarettes would be paternalistic, robbing African American smokers of their right to choose which products to use. Others, including many black health advocates, counter that it’s racist not to ban a dangerous product pushed for years by what they call predatory, racially targeted marketing.” (Knowles and McGinley 2019).

Alignment with International Trade Obligations: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. There are no international standards on flavours as flavour restrictions are not in place in very many areas.

Ban All Flavours Excluding Menthol and Ban Flavours with Additional Exceptions

Effects: The mid-range policy option of banning all but menthol/mint favours is being adopted or considered in some jurisdictions. This option may seem appealing in that it allows access for smokers to a flavour that may be appealing for them, while prohibiting all other flavours, like fruit and candy, that ostensibly are the ones that youth prefer. Important for informing debate about this policy option is that several studies indicate that menthol/mint e-cigarettes are already quite popular with young people (Leventhal et al 2019). In addition, experience with tobacco flavour bans suggests that those who are looking for a flavoured product are likely to make do with menthol/mint if no other flavours are available. Excepting other flavours in addition to menthol, as done or is proposed in New Zealand and Ontario, would likely further decrease the possibility that youth would be less inclined to use e-cigarettes as evidence presented above indicates their preferences for flavours. Moreover, as noted above, JUUL's voluntary self-restrictions on youth did not overall decrease youth e-cigarette use.

Technical Feasibility: There is some American data suggesting that many e-cigarette users would try circumventing a ban on flavoured e-cigarettes. A majority of participants in the Du et al study said that they would turn to the illicit market, make their own flavours or even revert to combustible cigarette smoking – for current and former smokers (Du et al 2020). Amongst the dangers of illicit flavoured e-liquids are toxicities perhaps not unlike those being revealed in EVALI cases. Fighting an illicit market for flavoured e-liquids is likely a substantial challenge.

Political Viability: Liber et al (2020) suggest shortcomings of self-regulation and highlight the utility of government regulation. Much of the rhetoric around this remains from the tobacco industry around “harm reduction,” arguing that that flavour bans will keep cigarette smokers from turning to e-cigarettes. As exceptions to flavour bans for menthol cigarettes have been accepted practice in many jurisdictions, including Canada until recently and still including the United States, there is likely public perception that menthol is somehow different from other flavours and would be somehow acceptable. Industry representatives fight hard for excepting at least menthol from flavour bans as a concession to their claimed servicing of smokers trying to quit combustible

cigarettes or for harm reduction. In the United States the current FDA enforcement policy, does not prioritize cartridge-based menthol and tobacco flavoured e-cigarettes because they are not popular amongst youth (U.S. Food and Drug Administration 2020a).

According to the New York Times, in their lobbying on this issue, industry representatives in the United States argue, “that adult smokers need e-cigarette options to help them switch from cigarettes — and that because 35 percent of cigarettes sold are menthol brands, taking menthol flavors off the market would pose a hardship for those smokers trying to quit.

The companies also say that a full flavor ban would put thousands of vape shops out of business.” (Kaplan and Haberman 2020)

Alignment with International Trade Obligations: The US experience with banning clove cigarettes serves to illustrate the challenge of banning some flavours without banning all flavours. Indonesia entered a TBT complaint at WHO against the US exemption of menthol cigarettes while it banned clove flavoured cigarettes (which were generally imported from Indonesia). The deliberations of the appellate body are important in considering the potential of complaints on bans of some e-cigarette flavours while allowing others:

While the appellate body recognized section 907’s aim of reducing youth smoking as “a legitimate objective,”¹² the appellate body questioned whether 907 actually operates to serve this aim because “menthol cigarettes have the same product characteristic that, from the perspective of the stated objective of Section 907(a)(1)(A), justified the prohibition of clove cigarettes” – namely a flavor that masks the harshness of tobacco, making cigarettes more palatable to inexperienced smokers.¹³ The appellate body also rejected the United States’ argument that the exemption of menthol was created to address legitimate regulatory concerns, unrelated to national origin: 1) that prohibiting a product used by millions of smokers will overwhelm the health system with nicotine addicts experiencing withdrawal symptoms, and 2) that a prohibition would lead to an increase in smuggling and illicit sales of menthol cigarettes.¹⁴ The appellate body did not find these arguments credible, stating that “it is not clear that the risks that the United States claims to minimize by allowing menthol cigarettes to remain in the market would materialize if menthol cigarettes were to be banned, insofar as regular cigarettes [which, like menthol cigarettes, contain nicotine] would remain in the market.”¹⁵ (Public Health Law Center 2020b)

Ban Flavours in Closed Systems Only

Effects: Cartridge-based e-cigarettes consist of, include, or involve a cartridge or pod that holds liquid that is to be aerosolized when the product is used. There is not a significant amount of data on bans on only cartridge ENDS. Notwithstanding, JUUL (a cartridge-only device) imposed restrictions on their products to only menthol and mint provide us with some detail (Liber et al 2020). After a loss in sales following their decision to withdraw most flavored products from stores, JUUL sales recovered within weeks and surpassed their previous maximum in the same categories, as consumption simply switched to the menthol/mint and tobacco flavors that had not been banned. Additionally, many other companies took up the non-menthol flavoured market once JUUL abandoned it, signalling a need for more comprehensive, industry-wide regulation.

The voluntary JUUL flavour ban, overall, had mixed results: five months after JUUL abandoned fruit flavored pods, Tackett et al (2020)'s study found that among youth who had tried JUUL, only 28% signalled that the flavor restrictions had affected their use; of those, 46% stopped using JUUL, 27% changed their purchasing behavior to either obtain pods online or use non-JUUL branded pods, and 25% switched to a mint or tobacco flavor.

Additionally, once JUUL withdrew fruit and sweet flavors from stores, a new expansion in fruit-flavor sales by non-JUUL brands occurred (Liber et al 2020).

Technical Feasibility: It is likely that some participants would turn to the illicit market. Many youth would likely still use open-ended vaping products, as noted in the evaluation of the JUUL voluntary ban above. This would also require significant oversight, particularly of online marketplaces (both those operating illegally in the jurisdiction and international sellers). Despite complications, a closed system flavour ban from the United States makes this a more attractive option for Canadian policymakers, given that it aligns with already existing regulation south of the border.

As noted in the data above, a reduction in cartridge use would likely have limited impact overall of youth vaping.

Political Viability: This is also a mid-level policy, given that it compromises from a full ban, while also significantly reducing flavour availability. The United States recently issued a policy prioritizing enforcement against certain unauthorized flavored e-cigarette products that appeal to kids, including fruit and mint flavors. Under this policy, companies that do not cease manufacture, distribution and sale of unauthorized flavored cartridge-based e-cigarettes (other than tobacco or menthol) within 30 days risk FDA enforcement actions. The focus on cartridge-based products is justified through their particular appeal to youth.

Alignment with International Trade: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. There are no international standards on flavours as flavour restrictions are not in place in very many areas.

Restrict Flavours to Adult-Only Stores

Effects: Restricting the sale of whatever flavours are allowed (including menthol/mint only) to adult-only stores is a policy option being put forward in several jurisdictions. While this option holds some promise, implementation challenges to date suggest that many adult-only vape shops are non-compliant in that they are selling to minors and experience from other substances suggests that youth will continue to access from social sources. A version of this policy goes into effect in Ontario on July 1, 2020, however, e-cigarettes with tobacco, mint and menthol flavours will still be sold in stores other than specialty vape stores.

Technical Feasibility: The effectiveness of restricting flavour sales to adult-only stores will depend on the ability to prevent youth from accessing products in these stores and from obtaining the flavours through social sources. The very large numbers of minors who are currently accessing e-cigarette products despite age restrictions and the experience with alcohol access for minors despite it being sold exclusively in adult-only stores raises concerns about the likely effectiveness of this policy option in keeping flavoured e-cigarettes out of the hands of young non-smokers.

Health Canada recently noted that vape shops have “unacceptable” levels of non-compliance with federal vaping laws. In a December letter to retailers, the department noted that more than 80 per cent of specialty vape shops that inspectors visited last year were selling and promoting products in violation of federal law, including promoting flavours that appeal to young people. It would thus be vital that this policy involved significant oversight and penalties for non-compliance.

Political Viability: In a recent Canadian survey, over 82% of participants supported restricting flavoured vaping products to adult-only stores (Angus Reid 2020). This would require significant regulation and oversight, given how frequently vaping minimum age restrictions are currently circumvented by stores.

Notwithstanding, there would be an inevitable pushback from age-unrestricted stores that are currently permitted to sell vaping products.

Alignment with International Trade Obligations: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. There are no international standards on flavours as flavour restrictions are not in place in very many areas.

Allow Flavours Only in Medicinal Products Available to Smokers

Effects: There is some precedent for this approach, as doctors currently prescribe cessation medications and recommend Nicotine Replacement Therapy (NRT), often in the form of patches, and in combination with nicotine gums. Flavoured vaporizers could be simply added to this group of therapies, particularly when combined with behavioural support. NRT is considered one of the most effective methods of quitting smoking and allows for significant oversight over the process. Yet there is little precedent for allowing flavours only in medicinal products, and there is thus little data available to evaluate.

Australia, for instance, has banned all e-cigarettes other than for therapeutic use. Yet the Therapeutics Good Administration has not approved *any* e-cigarettes for sale to help people quit smoking as of March 19, 2020. This may indicate the difficult administrative processes in getting approval, and the balance that government will have to strike to ensure that e-cigarettes really are available to smokers that require them for medical assistance.

Technical Feasibility: Given the current infrastructure for cessation medications, implementation of this approach would likely not prove overly difficult. However, a number of complications would also emerge: some vapers that might want to legally purchase flavoured e-cigarettes could begin smoking so that they are eligible for the prescription; if the prescriptions are only available to adults, underage smokers that want to quit using flavoured e-cigarettes might not have access to them and remain smoking cigarettes; there would inevitably be a black market of flavoured e-cigarettes (as well as circumventions of the rules by selling “food flavouring” that can be added to vaporizers).

As previously noted, there is American data suggesting that many e-cigarette users would try circumventing a ban on flavoured e-cigarettes. A majority of participants in the Du et al study said that they would turn to the illicit market, make their own flavours or even revert to combustible cigarette smoking – for current and former smokers (Du et al 2020).

Political Viability: This would require significant buy-in from pharmacies/medical groups that would have to administer these prescriptions. Promoters of e-cigarettes for harm reduction and for smoking cessation oppose medicalization in that it would limit the widespread availability and easy access felt necessary to attract large numbers of smokers to trying e-cigarettes. They argue that making the purported less harmful substance less available than the more harmful substance (combustible cigarettes) counters the notion of harm reduction.

The general view that adults have the right to choose harmful and addictive lifestyles would remain. Given that we are in an era of moving *towards* legalization of other substances, making any product solely available through medicinal means will inevitably face pushback. One way to balance this is by making only certain flavours available by prescription, while permitting a tobacco flavours to remain on the regular market.

Alignment with International Trade Obligations: The agreements managed by the World Trade

Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. There are no international standards on flavours as flavour restrictions are not in place in very many areas.

Allow All Flavours

Effects: Providing no restrictions on flavours would likely mean little change to youth uptake of vaping. Given the correlates between flavour deregulation and youth vaping, this would likely lead to significant increases in underage vaping.

Technical Feasibility: This would not prove difficult, as it would require no new regulatory legislation.

Political Viability: In the United States, this approach would be quite popular among industry lobbyists, and conservative organizations like Americans for Tax Reform, which oppose regulatory limits because of their harm to small businesses, vape stores and retailers. Tobacco and vaping companies have argued that adult smokers need e-cigarette options to help them switch from cigarettes — and that because 35 percent of cigarettes sold are menthol brands, taking menthol flavors off the market would pose a hardship for those smokers trying to quit.

There has, however, been pushback to this. Rising awareness of the harm of vaping to youth has put political pressure on governments to make changes. Flavour restrictions or bans are considered less draconian and are therefore more politically palatable than device bans. A majority of Canadians support restrictions on flavours in some form.

Alignment with International Trade Obligations: The agreements managed by the World Trade Organization contain obligations relevant for health regulation, most particularly those managed under agreements on Technical Barriers to Trade (TBT). Under these agreements, Canada is required to provide notification to the TBT Committee for regulations if the regulations (a) may have a significant effect on trade and (b) if there is no international standard to validate the regulation or the regulation is not aligned with an international standard. There are no international standards on flavours as flavour restrictions are not in place in very many areas.

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Regulatory Policies for E-Cigarette Marketing

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Introduction

With the legalization of nicotine e-cigarettes in 2018, Canada's federal government opted to regulate their marketing differently than combustible cigarettes. Essentially most marketing and promotion was allowed so long as it was not youth appealing. Other stipulations prevent misleading advertising and sponsorships. Two years later, 29% of youth in grades 9 to 12 report using e-cigarettes in the past 30 days and 40% of them are daily users (CSTADS). Aggressive marketing has been highlighted as a key contributor to this alarming surge in e-cigarette use by youth who almost all are not and would not have become combustible cigarette smokers.

In considering regulatory policy options regarding e-cigarette marketing, the substantial experience with tobacco marketing bans can be illuminative. There are also lessons to be learned from alcohol marketing regulation approaches.

Marketing Restrictions for Tobacco

There is a considerable body of evidence, including systematic reviews and a US Surgeon General Report (2012), providing conclusive evidence that exposure to tobacco marketing contributes to combustible smoking initiation and use (SFOSAC 2017).

Conversely, there is considerable evidence that comprehensive advertising bans contribute to decreasing smoking initiation and use (WHO 2015 in SFOSAC 2017). Yet, studies have found that partial or voluntary advertising bans have little or no effect (Hoffman 2015, WHO 2015 in SFOSAC 2017). Partial or voluntary bans have lesser or no impact as the tobacco industry has been adept at exploiting marketing opportunities not covered (Wilson 2012; US Surgeon General 2014 in SFOSAC 2017).

This evidence is reflected in Article 13 of the WHO Framework Convention on Tobacco Control, which states: "... a comprehensive ban on advertising, promotion and sponsorship would reduce the consumption of tobacco products. Each Party shall ... undertake a comprehensive ban of all tobacco advertising, promotion and sponsorship".

Canadian law bans tobacco advertising on television and radio and in most, but not all, forms of print media. Sponsorships have also been banned. Still permitted are smoking in movies, direct mail to an identified adult and signage in places when young people are not permitted.

Canadian law now also prescribes that plain and standardized packaging for tobacco products. Warnings must make up 75% of both front and back packaging for smoked tobacco products, however warnings for smokeless tobacco products must make up 50% of front and packaging (Tobacco Control Laws, 2020). Packaging emerged as one of the last vestiges of tobacco marketing. Often overlooked, packaging is nevertheless a important marketing avenue. It is “1) present during the purchase of tobacco products, 2) has extensive reach to all purchasers and most users, 3) is a source of information and 4) consumers are intimately involved with the package, including its public display, which implicitly endorses the product (especially for children) (SFOSAC 2017).

The effectiveness of plain and standardized packaging, i.e. banning marketing through packages, has been studied considerably. “Overall, there is a strong body of empirical evidence from both pre-implementation (experimental) and post-implementation (real world) studies that supports the introduction of plain packaging. There is evidence to suggest that plain packaging reduces the attractiveness of tobacco products, restricts use of the pack as a form of advertising and promotion, limits misleading packaging and increases the effectiveness of health warnings” (SFOSAC 2017).

Effects of E-Cigarette Marketing

Kreitzberg et al (2019) provide an excellent review of studies on the effects of e-cigarette marketing. Laboratory experiments, including randomized control trials indicate that e-cigarette advertising affects attitudes and susceptibility to using e-cigarettes (Pokhrel et al, Villanti et al, in Kreitzberg 2019).

In the first real-world study of the effects of e-cigarette marketing, Kreizberg et al (2019) followed 5,478 students from 24 2-year and 4-year Texas colleges over a period of 18 months. They found that exposure to e-cigarette marketing predicted e-cigarette initiation and sustained e-cigarette use.

Exposure to E-Cigarette Marketing in Canada

Table 1 uses data from two Environics Research public opinion surveys to compare exposure to a variety of advertising sources. The first survey was conducted online between February 4 and 26, 2019. Participants included youth vapers (age 15-19), young adult vapers (age 20-24), and adult vapers (age 25+). The survey received responses from 2027 participants. The second survey was conducted between May 27 and June 25, 2019. Participants were Canadian vapers aged 15 and older. A total of 2043 participants were included in the study. Numbers represent the proportion of survey participants who have seen or heard an ad from the listed sources. Participants were able to choose multiple options: Data was extracted from Environics Research (2019a) [3] and Environics Research (2019c) [15]:

Table 1: Location of Advertising or Promotional Material about Vaping

Where did you see or hear this advertising or promotional material?	Environics Research (2019a) [3]	Environics Research (2019c) [15]
Social Media	40%	42%
Vape Shops (physical/not online)	31%	37%
Website	30%	34%
TV/Radio/streaming music services (e.g. Spotify)	25%	16%
Convenience store	25%	25%
Outdoor billboards/posters	14%	13%
Email	14%	16%
Newspaper/magazines	12%	11%
Other store that sells cigarettes	12%	12%
In the mail	11%	8%
Bar	9%	10%
At an event	9%	10%
Pharmacy	9%	7%
Recreational facilities	7%	6%
On/inside taxis/public transit	7%	7%
Other	1%	1%

Out of those who saw ads over social media, 27% were exposed over Facebook, 25% over Instagram, 19% on YouTube, 11% on Snapchat, and 7% on Twitter [15].

Other forms of advertising include online videos. Researchers discovered over 8,000 JUUL-related videos that received a total of 260 million views over the 3-year period from 2016 to 2018 (Truth Initiative, 2019). Of the 8,083 JUUL-related videos found, the majority were on channels that appeal to youth.

Effects of E-Cigarette Marketing Restrictions

To our knowledge, no direct studies have been published that evaluate the effectiveness of e-cigarette marketing restrictions. One study that compared e-cigarette use in Canada, the US and the England, found lower rates of youth use in England. The authors consider that marketing restrictions may contribute to these lower rates alongside England's promotion of e-cigarettes to smokers as a cessation mechanism (Hammond et al 2019).

Marketing Restrictions for Alcohol

The association between exposure to alcohol marketing and both drinking initiation and increased drinking among youth is similar in nature to that of tobacco marketing (see Wettlaufer et al 2017 for a review).

In Canada, alcohol advertising directly to youth is prohibited, "however, they do not place limitations on the volume of alcohol advertising, restrict all types of content that may appeal to youth, or apply to all types of advertising media" (Heung, Rempel, & Krank, 2012 in Wettlaufer et al 2017).

A common approach to regulating alcohol marketing is to rely on industry self-regulatory codes of practice (Monteiro et al 2017). However, systematic reviews of industry self-regulation demonstrate that it has not effectively protected youth from alcohol marketing. (Monteiro et al 2017). Indeed, not one of over 100 studies reviewed found self-regulation to be effective.

Jurisdictional Scan of Regulatory Policies Related to Marketing of E-Cigarettes

With respect to marketing of e-cigarettes, the World Health Organization (2019) has suggested that regulation should aim to impede promotion and uptake by non-smokers, pregnant women,

and youth. Although studies have shown that there is a strong relationship between e-cigarette marketing exposure and increased use of e-cigarettes (Mantey et al, 2016; Kreitzberg et al, 2019; Du et al, 2020), there is a wide range of marketing requirements among jurisdictions across the world. Note that the countries discussed below are those that have not enacted a jurisdiction-wide ban on e-cigarettes entirely.

The table below provides a summary of various policies related to marketing of e-cigarettes in place in different jurisdictions:

United States (US)

Unlike combusted cigarettes and smokeless tobacco products, for which advertising through television and radio, electronic cigarettes are advertised through television, radio, and online. The FDA has noted its “concern” about tobacco products that are promoted towards youth, particularly with kid-friendly labelling. The FDA has signalled that it will continue to monitor and enforce bans on advertising that is deemed to be aimed towards youth, however recent enforcement has not been reported outside of warning letters (FDA, 2020).

As of September, 2019, vaping ads are being refused by various American media conglomerates, including CBS, Viacom, and WarnerMedia (Statt, 2019).

Marketing materials cannot claim that the product exposes users to fewer toxins or reduces harms, unless FDA-approved. The FTC recently announced that all marketing data from 2015-2018 must be provided by six of the best-selling e-cigarette companies in the U.S., signaling the first time such information will be collected by the FTC.

Twenty-nine states (PHLC, 2019) in the US have enacted laws that regulate the product packaging of e-cigarettes, including rules that require that they be child-resistant, including: Alabama, Arkansas, California, Illinois, Indiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, and Wyoming.

Table 2 outlines other state regulations related to advertising and marketing (PHLC, 2019).

Table 2: State Regulations Related to Advertising and Marketing of E-Cigarettes

Legislation	State(s)
Self-service displays of electronic smoking products prohibited except in specialty tobacco shops restricting entry to adults	Alaska, Arkansas, Connecticut, Florida, Idaho, Illinois, Iowa, Kansas, Louisiana, Minnesota, Nebraska, New York, North Dakota, Oklahoma, Oregon, Pennsylvania, South Dakota, Vermont Washington, Wyoming
Self-service displays of e-cigarettes and nicotine liquid prohibited	New Mexico
Prohibits advertising e-cigarettes through websites and mobile applications that are directed at minors, as well as prohibits advertising tobacco on outdoor billboards that are within 1000 feet of a school or public playground; Self-service displays of electronic cigarettes prohibited	California
Prohibits marketing or advertising tobacco substitutes on online or mobile applications directed to children. Self-service displays of electronic cigarettes are also prohibited.	Delaware
Manufacturers, distributors, and retailers prohibited from marketing e-liquid as a modified risk product	Indiana, Michigan, Maine
Prohibits advertising tobacco products in retail tobacco stores; cannot sell, use fraudulent and misleading statements, or display advertisements with celebrities, cartoons, or other endorsements; Self-service displays and vending machine sales of electronic smoking devices restricted to adult-only facilities	Massachusetts
Prohibits advertising e-cigarettes on transit	New Jersey

There are **no federal regulations** on e-cigarette advertisements on television, radios, in print, and digital marketing. However, the Food and Drug Administration (FDA) released its **enforcement policy** in early 2020, through which the FDA aims to prohibit the false or misleading labeling and/or advertising that resemble kid-friendly products. The FDA **sends warning letters** to e-cigarette manufacturers cautioning against policy breaches, including marketing that contains unauthorized cessation claims and marketing practices that appear to target youth.

Since May 2018, FDA has also issued over 40 warning letters to manufacturers, distributors, and retailers for selling e-liquids with false or misleading labeling and/or advertising that resemble kid-friendly products.

The Federal Cigarette Labeling and Advertising Act prohibits states and jurisdictions from regulating the marketing and sale of cigarettes, however this law does not apply to other non-cigarette tobacco products like e-cigarettes. While some states have taken advantage of this, advertising restrictions may face legal challenges related to commercial speech.

(FDA, 2020).

Canada

Canada's [Tobacco and Vaping Products Act](#) provides a framework for regulating vaping products in the country. Health Canada has [proposed new regulations](#) to put limits on advertising and promotion, particularly advertising that is done in a manner that can be seen or heard by young person. The regulations also propose to make health warnings on vaping products mandatory, including potentially the following language:

- “WARNING: Vaping products contain nicotine, a highly addictive chemical.”
- “WARNING: Vaping products release chemicals that may harm your health.”

The Federal Minister of Health, Patty Hajdu, announced draft new federal promotion regulations for vaping products in 2019, with advertising to be banned in locations viewed by youth. In a Notice of Intent from Health Canada in November 2019, all thirteen provincial and territorial governments strongly recommended immediate regulatory measures to reduce youth uptake of vaping products. They suggested that all forms of vaping advertising and promotion restrictions should align with those in place for tobacco products. The consultation period for draft regulations ended on January 20, 2020.

All 11 of 13 provinces/territories that have general legislation on e-cigarettes also ban the visible product display of e-cigarettes, as well as e-cigarette advertising at retail stores, but exceptions are made for specialty vape stores.

Canadian provinces and territories have a mosaic of regulation related to marketing and advertising (PSFC, 2020). Saskatchewan, Manitoba, Quebec, Nova Scotia, and Prince Edward Island have banned e-cigarette advertising on billboards and outdoor signs. Manitoba, Quebec,

Nova Scotia, and Prince Edward Island have also prohibited broadcast advertising. British Columbia, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland have measures in place that ban ads in stores and on displays.

Alberta

There are no current advertising regulations on e-cigarettes in Alberta, however the health Minister has asked for a review of legislation for Fall 2020.

British Columbia

In November 2019, British Columbia tabled a Provincial Vaping 10 Point Action Plan that includes strengthening restrictions on public advertising.

Manitoba

Manitoba's ban on the advertising and promotion of tobacco products covers e-cigarettes as well.

New Brunswick

Outdoor advertising by specialty vaping stores is prohibited and promotional material inside the shops cannot be viewed from the outside. Restrictions on promotional materials applicable to tobacco in other retail shops also apply to e-cigarettes.

Newfoundland and Labrador

Promotional materials for vaping products cannot be visible inside or outside the shop where they're sold.

Northwest Territories

Effective March 31, The Smoking Control and Reduction Act came into effect in the Northwest Territories. Details of regulations are yet to be fully released.

Nova Scotia

In addition to a ban on all flavoured e-cigarettes, specialty vape stores may not display e-cigarette advertising outside their businesses.

Nunavut

No current regulations on e-cigarette advertising, however the Chief Medical Officer of Health as said new restrictions will take place in 2020.

Ontario

On February 28, 2020, Ontario announced that requires specialty vape stores to ensure that vapour product displays and promotions are not visible from outside their stores. If approved, as of May 1, 2020, specialty vape stores would need to ensure that vapour product displays and promotions are not visible from outside their stores.

Prince Edward Island

Vape shops may not display e-cigarette devices in a way that makes them visible from outside the store.

Quebec

Electronic cigarette advertising, other than ads in newspapers or magazines that have an adult readership of at least 85%, is prohibited. The display of e-cigarettes in stores accessible to people under age 18 is also prohibited.

Saskatchewan

The Saskatchewan government passed amendments to its Tobacco Control Act to match vaping legislation with smoking legislations. The new rules restrict the sale of vaping prohibit the promotion of vaping products in businesses commonly used by youth, such as arcades, theatres and amusement parks.

Yukon

No current laws on advertising.

(Canadian Press, 2019; Ontario, 2020; Nova Scotia, 2020)

European Union (EU)

Under the EU's Tobacco Products Directive (2014/40/EU) (Directive), Member States must ensure that e-cigarette packaging contain health warnings, including one of the following texts:

- “This product contains nicotine which is a highly addictive substance. It is not recommended for use by non- smokers”, or
- “This product contains nicotine which is a highly addictive substance.”

Promoting e-cigarettes through any form of public or private contribution to radio programs, or promotional elements on packaging are also prohibited.

The EU regulates most tobacco advertisements, including direct tobacco advertising on national TV and radio, in local magazines and newspapers, and on billboards (96%, 89% and 83% of countries regulating these forms of tobacco advertisements respectively). In contrast, the least regulated forms of TAPS include tobacco point-of-sale display and indirect promotion through appearance of tobacco products in TV and/or films (regulated in 19% and 15% of countries respectively).

(World Health Organization, 2019)

Specifically, the Directive states the following:

5. Member States shall ensure that:

- (a) commercial communications in Information Society services, in the press and other printed publications, with the aim or direct or indirect effect of promoting electronic cigarettes and refill containers are prohibited, except for publications that are intended exclusively for professionals in the trade of electronic cigarettes or refill containers and for publications which are printed and published in third countries, where those publications are not principally intended for the Union market;
- (b) commercial communications on the radio, with the aim or direct or indirect effect of promoting electronic cigarettes and refill containers, are prohibited;

(c) any form of public or private contribution to radio programmes with the aim or direct or indirect effect of promoting electronic cigarettes and refill containers is prohibited;

(d) any form of public or private contribution to any event, activity or individual person with the aim or direct or indirect effect of promoting electronic cigarettes and refill containers and involving or taking place in several Member States or otherwise having cross-border effects is prohibited;

(e) audiovisual commercial communications to which Directive 2010/13/EU of the European Parliament and of the Council applies, are prohibited for electronic cigarettes and refill containers.

The European regional office of the World Health Organization made aimed to, by 2025: “Undertake, in accordance with its constitution or constitutional principles, a comprehensive ban on all tobacco advertising, promotion and sponsorship, including a display ban on tobacco products at points of sale and cross-border advertising, that covers traditional media (print, radio and television) and all media platforms, including the Internet, mobile telephones and other new technologies, as well as films [Article 13 (1)].” (Regional Committee for Europe, 2015).

Germany

In November 2019, Germany’s new drug commissioner, Daniela Ludwig, called for a ban on billboards or posters advertising cigarettes and e-cigarettes in public spaces. The legislation has not been implemented as of yet.

Vaughan et al. (2020)

Various advertising legislations are currently being considered by individual EU countries, including Scotland (further complicated by the U.K.’s departure from the EU). Ireland’s advertising restrictions require that the content of websites must not have the aim or the direct or indirect effect of promoting e-cigarettes or refill containers (e-liquids containing nicotine).

The following are examples of practices that are considered to breach this:

- Offering discounts or offers on products.
- Free delivery.
- Offers for bulk buying.
- Non-factual information e.g. expansive descriptions of the taste of the product.
- Pictures surrounding the image of the product, e.g. of food products etc.
- Health warnings not as prescribed i.e. products offered for sale in the Republic of Ireland must carry the health warning as prescribed in the Irish and English language on the unit packet (refill container/bottle) and on the outside packaging.
- Star ratings, reviews.
- Reward points etc.
- The use of other social media sites to promote e-cigarettes and refill containers (e-liquids containing nicotine) is also prohibited.

(Health Services Executive, 2018)

Countries Outside of the EU, Excluding North America

Other jurisdictions have varying regulations on marketing and advertising as well (GTC, 2019):

- Costa Rica: Restricts advertising, promotion, and sponsorship of e-cigarettes to adult-only venues and events or through direct communications.
- Ecuador: Restricts advertising to venues accessed only by adults.
- Gambia: Prohibits all domestic and cross-border tobacco advertising, promotion, and sponsorship.
- Israel: Prohibits the advertising, promotion, and sponsorship of all smoking products, including e-cigarettes; with exceptions:
 - The law excludes and allows advertisements of a smoking product in printed press on the sole condition that names or images of people, animals, limbs or plants will not be part of them, that the advertisement is not placed in a newspaper or a section designated for children or dedicated to health or entertainment, that at least 30% of the advertisement area will carry a health warning advertised next to the warning message.

- The law permits sending advertising material, in writing only, to a recipient who is 21 years old and onwards and who requests to receive it.
- The law bans the distribution, dispensing or the lending of smoking products during the marketing and promotional events of products that are non-smoking products or in exchange for another product.
- Banning the showcasing of smoking products in points of sale, excluding specialty shops or a designated area
- Honduras: Prohibits the advertising, promotion, and sponsorship of e-cigarettes.

New Zealand

New Zealand has taken a relatively “balanced” approach to marketing regulations that “recognises that smokers need support and advice to successfully switch to a much less harmful product” (New Zealand, 2020). Thus, information about and the display of, in accordance with regulations, vaping products in any retail store or on any Internet site, is still permitted. The bill also repeals the provision that allows an exemption from the Act’s advertising and sponsorship prohibitions for multi-national sporting event (until 2020, cigarettes and e-cigarettes were permitted to be advertised at these events). Lastly, New Zealand includes advice given by specialist vape retailers and health workers under the jurisdiction of “advertising.” Both groups are allowed to provide recommendations to consumers (whether the vaping is for recreational use or switching away from smoking).

Discussion

E-cigarettes are and will likely continue to be available for sale in Canadian jurisdictions in consideration of their potential as a combustible cigarette cessation support and for harm reduction. There is broad consensus that young people who do not or would not otherwise smoke combustible cigarettes should not use e-cigarettes so as not to become addicted and so as to avoid respiratory, cardiovascular and other potential health harms. Yet, the regulatory approaches adopted to date by Canadian jurisdictions has failed to prevent young people from becoming regular users of e-cigarettes and becoming dependent on them.

There are a range of regulatory policies regarding e-cigarette marketing that could curtail development of dependence and possible uptake of smoking by young non-smokers (Table 4). In considering which regulatory policy options to pursue, it is important to consider their likely effects on young non-smokers as well as on the overall use of nicotine and potential of e-cigarettes to support smokers in quitting and harm reduction.

Table 3: Regulatory Policy Options and Assessment Criteria

	Effect on nicotine use by youth and adults	Technical Feasibility	Political Viability	Alignment with international trade obligations
No restrictions				
Restrict to not youth appealing				
Industry self-regulation				
Restrict to adult only venues and channels/targeted marketing to smokers				
Partial marketing bans: prohibit broadcast advertising, billboards				
Comprehensive ban				

No Marketing Restrictions

Effects: Studies on the effects of e-cigarette marketing on initiation and sustained use, as well as American experience to date make it abundantly clear that not imposing any restrictions on marketing would not protect young non-smokers from e-cigarette use. There have been no direct comparisons of changes in the prevalence of combustible cigarette use, initiation and cessation between countries that ban and do not ban e-cigarette marketing outright.

Technical Feasibility: No challenges.

Political Viability: There is strong public support for at least some restrictions on e-cigarette marketing. According to an Angus Reid survey commissioned by Health Canada, 90% of Canadians support, ‘banning advertising of vaping products in areas that young people frequent – like bus shelters, parks, and areas around schools’ (Angus Reid 2020). As current Canadian regulations already prohibit marketing that is youth appealing, it would not be politically viable to move in the opposite direction of what the vast majority of Canadians support.

Alignment with International Trade Obligations: No challenges.

Restrict to Not Youth Appealing

Effects: This is the approach currently in place in Canada. While it has not been rigorously evaluated, it is evident from Health Canada Public Opinion Research studies that youth are being exposed to large amounts of marketing from a variety of sources despite this restriction. Moreover, there is abundant evidence from experience with non-youth appealing marketing stipulations for tobacco, food and alcohol demonstrating that marketing that is appealing, but not exclusively appealing to youth, is effective in attracting them to using these products. This would also include provisions that specific youth-friendly spaces (e.g. particular YouTube channels and social media outlets) not allow for any vaping advertisements.

Technical Feasibility: A supreme court ruling has legitimized the youth appealing stipulation making it necessary to demonstrate that marketing is not exclusively appealing to youth in order

for it to not be compliant. This stipulation therefore allows industry much leeway to market its products in ways that are appealing to both youth and others, substantially limiting the potential that youth appealing restrictions would substantially decrease the effects of marketing on youth. “Section 22(3) [of the Canadian Charter of Rights and Freedoms] requires the prosecution in a given case to prove that there are reasonable grounds to believe that the advertisement of a tobacco product at issue could be appealing to young persons, in the sense that it could be particularly attractive and of interest to young persons, as distinguished from the general population (Canada vs JTI McDonald 2007).”

Political Viability: Data presented above indicates that some 90% of Canadians support greater restrictions on marketing, suggesting opposition to this current situation of restricting only marketing that is youth appealing. At the same time, industry is strongly supportive of this measure which provides it the opportunity to appear to not be targeting youth while still promoting their products in ways that are very much appealing to youth while also being appealing to adults. The Supreme Court ruling creates a challenge for government to change this policy.

Alignment with International Trade Obligations: Youth appealing restrictions have been in place for quite some time and as such would be determined normal practice and not likely subject to appeal.

Industry Self-Regulation

Effects: Evidence from alcohol industry marketing self-regulation is very clear about its failure to protect youth. As noted above, systematic reviews of industry self-regulation demonstrate that it has not effectively protected youth from alcohol marketing.

Considering the track record of the tobacco industry, which owns or partially owns major e-cigarette companies, there is strong reason to expect that e-cigarette industry marketing self-regulation would not be effective.

A recent review by Public Health Ontario summarizes experiences in self-regulation by tobacco and alcohol industries:

To explain further, the tobacco industry developed a number of programs in response to objections to marketing practices targeting youth. These programs are prime examples of self-regulation used to deflect legislative action.²⁶ These efforts included initiatives against youth access (i.e. *Action Against Access* and *We Card*), industry sponsored educational programs, partnerships (i.e. alliances sought with *Young Men's Christian Association* and *Boys and Girls Clubs*) and media campaigns.^{26,27} Such initiatives were designed to avoid addressing the link between smoking and chronic disease which ensured they did not contradict with advertising messages, potentially encouraging young people to smoke.²⁶ A similar trend was apparent in the self-regulation practices of the alcohol industry which developed programs targeting underage drinking and access not making mention of the link between alcohol and chronic disease and containing vague messages such as “please drink responsibly” that are associated with positive brand perceptions.²⁵

At present, evidence suggests the alcohol industry is not adhering to self-regulation guidelines.^{28,29} The impact is that self-regulation and voluntary codes fail to protect vulnerable populations such as youth¹, persons in recovery, persons currently dependent on alcohol and non-drinkers from exposure to alcohol marketing.^{2,30} In addition, self-regulation guidelines do not apply to all types of marketing e.g. ads delivered through SMS technology, internet ads, events sponsorship and branded merchandise.³¹ The alcohol industry seems to interpret advertising codes more leniently than public health experts, highlighting the need for a pre-screening process to flag any alcohol advertisements that are deemed unacceptable according to the Canadian Radio-television and Telecommunications Commission (CRTC) code.³² Furthermore, voluntary codes may be developed or changed to render previous violations acceptable,^{26,28,30} or in times of economic downturn to protect industry profits.² (Ontario Agency for Health Protection and Promotion 2016.)

Technical Feasibility: As this is voluntary industry self-regulation there are no technical feasibility challenges for government.

Political Viability: Public support for more restrictions on e-cigarette marketing suggest that leaving decisions in the hands of the industry would not be well accepted.

Alignment with International Trade Obligations: No challenges.

Restrict to Adult-Only Venues and Channels/Restrict to Targeted Marketing to Smokers

Effects: Essentially, restricting to adult venues/channels has been the regulation in place for tobacco advertising in Canada. If it were possible to assure that marketing was indeed only in strictly adult venues and channels it would likely have some effect. However, the evidence presented above on partial bans on marketing suggest strongly that this would not work well in protecting youth from exposure to e-cigarette advertising. Allowing only targeted marketing to smokers is untried. One way to do this is to allow, or even require, that e-cigarettes be promoted through inserts in cigarette packages. The attractiveness of this option is that it would allow marketing to reach smokers who might use e-cigarettes for cessation or harm reduction while not exposing young non-smokers.

Technical Feasibility: There are few venues and channels that can be exclusively restricted to adults. In particular, internet and social media platforms as well as streaming services create major challenges. Tobacco companies which own or partially own e-cigarette companies should have no problem in targeted promotion of e-cigarettes to smokers. There would be a challenge though for e-cigarette companies not affiliated with tobacco companies.

Political Viability: Politically, restricting marketing to adult only channels is an attractive option as it appears to protect youth non-smokers from exposure to e-cigarette advertising while at the same time allowing advertising to promote e-cigarettes for smoking cessation and harm reduction to adult smokers. Both the general public and industry are able to support this option. There is likely strong public support for restricting marketing to smokers only, however this stipulation would face opposition from e-cigarette companies not affiliated with tobacco companies and from others who might argue that this would be insufficient to attract large numbers of smokers to trying e-cigarettes.

Alignment with International Trade Obligations: While restricting marketing to adult-only channels would be considered normal practice, appeals could be made if marketing were to be restricted to smokers only.

Partial Bans – e.g. on Broadcast Advertising, on Billboards

Effects: Research, cited above, on partial tobacco marketing bans indicates that partial they are largely ineffective. Experience shows that prohibitions on marketing in only certain channels leaves open for the e-cigarette industry many alternative channels including social media, print advertising and streaming service advertising.

Technical Feasibility: Enforcement of any marketing bans can be challenging and requires investment of resources for monitoring, surveillance, charging and legal processes.

Political Viability: There is, as noted above, strong public support for protecting youth from e-cigarette marketing. Industry is likely to oppose even partial bans on marketing that is not exclusively appealing to youth. In part the political calculus would consider the potential relative costs of partial bans of less marketing to smokers for switching to e-cigarettes against the relative gains of such bans on decreasing the exposure of youth to marketing leading to their becoming regular e-cigarette users.

Alignment with International Trade Obligations: The EU has had marketing restrictions in effect now for several years and has not been subjected to appeals at the WTO. Moreover, in 2018, the WTO ruled that Australia's tobacco plain marketing measures did not constitute a trade restriction beyond what was reasonable to achieve a legitimate objective. To the extent that the potential harms of e-cigarettes will be considered by WTO to be commensurate with those from combustible tobacco, partial marketing bans would not be considered to not align with international trade obligations.

Comprehensive Bans

Effects: A truly comprehensive ban on e-cigarette marketing would apply to all venues and channels and include stipulations requiring plain packaging. Research, cited above, on the effects of comprehensive marketing bans for tobacco indicates that they are effective at reducing youth uptake. At the same time, a comprehensive ban on marketing would leave no way for e-cigarette companies to promote their products to smokers for harm reduction and cessation

purposes. Approving e-cigarettes as approved therapeutic devices that health care providers could prescribe or promote to smokers would perhaps be the only avenue through which they could be promoted for this purpose. The likely effect would be that less smokers would attempt to switch from combustible cigarettes to e-cigarettes.

Technical Feasibility: Enforcement of any marketing bans can be challenging and requires investment of resources for monitoring, surveillance, charging and legal processes.

Political Viability: While there is much public support for protecting youth from e-cigarette marketing, there is likely less of an appetite for a comprehensive ban. The e-cigarette industry would likely be supported by general business interests in opposing such a ban.

Alignment with International Trade Obligations: In 2018, the World Trade Organization made an important ruling concerning complaints against Australia's plain packaging rules for cigarettes. Importantly, the ruling upheld plain packaging in that:

“The complainants had not demonstrated that Australia's tobacco plain packaging measures (the TPP measures) are inconsistent with Article 2.2 of the TBT Agreement on the basis that they are more trade-restrictive than necessary to achieve a legitimate objective...” (World Trade Organization 2018)

Recognition by the WTO panel that marketing restrictions are necessary to achieve a legitimate objective and that they do not constitute unnecessary trade restrictions is a strong indication that comprehensive marketing bans for e-cigarettes would align with international trade obligations. This would assume that the WTO consider potential harms from e-cigarettes to somehow align with harms from combustible tobacco.

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BREATH E
the lung association



The 2020 Youth and Young Adult Vaping Project

September 11, 2020

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EXECUTIVE SUMMARY

Background: E-cigarette use (“vaping”) has been on the rise. The *2020 Youth and Young Adult Vaping Project*, conducted by The Lung Association of Nova Scotia and Smoke-Free Nova Scotia with funding from Heart & Stroke, aimed to examine the vaping behaviours, experiences, and product preferences of youth and young adult e-cigarette users in Canada.

Methods: Using an online survey, 1871 regular e-cigarette users (used an e-cigarette at least once a week for the past three months) between the ages of 16 and 24 and residing in one of six Canadian provinces (Alberta, British Columbia, Manitoba, Ontario, Nova Scotia, and Saskatchewan) were asked about their vaping behaviours (e.g., days vaped per week, number of episodes per vaped day, and number of puffs per vaping episode), experiences (e.g., co-use of other substances), and product preferences (e.g., nicotine concentration). This report details average responses across all regions and further segments findings by age, gender, and region.

Results: On average, respondents began vaping at the age of 15.74 years. More than half (59.0%) of all respondents reported having tried to quit vaping, with many making several attempts. The average e-cigarette user engaged in vaping behaviour six days per week and almost 30 vaping episodes per day, with approximately 6 puffs per episode. Since learning about the COVID-19 pandemic, respondents reported vaping less vaping days per week (5 days) and a marked decrease to 19 vaping episodes per day, but puffs per episode were nearly unchanged. On average, respondents spent between \$12 and \$16.47 per week on e-cigarettes. The overwhelming majority of respondents indicated that they have both used someone else’s e-cigarette (98.6%) and shared their e-cigarette with others (93.0%). For those that have shared their e-cigarette, the average number of people the e-cigarette was shared with was almost 23. Around half (50.3%) of all respondents had experienced a negative side-effect related to vaping. The majority of respondents reported exposure to vaping-related advertisements on social media platforms (74.0%). Users of pod-based devices constituted the largest proportion of respondents (62.0%). Almost all users used a flavoured vape juice at initiation (91.9%) and presently (90.4%). In most provinces, berry, mango, and mint/menthol were the most commonly reported flavours used at initiation and at present. Most users used vape juice containing the highest possible concentration of nicotine (50-60 mg/mL)¹ (66.2%). With respect to tobacco use, 64.3% of respondents were former users and 12.6% were current users. Current smokers used 11 cigarettes per week on average. A notable proportion of respondents (35.3%) indicated that they knew someone who started smoking after vaping. In the past 30 days, cannabis use (12 days of use) was more common than alcohol use (6 days of use).

Conclusions: Analysis of the total sample reveals concerning vaping behaviours among youth and young adults. Regular e-cigarette users report similar vaping behaviour and experiences across regions, though a number of notable differences at the individual- and regional-level emerged from our findings. In this report, we discuss our findings in the context of viable policy options to restrict the appeal and use of e-cigarettes among youth and young adults across Canada. These include a comprehensive flavour ban, limiting permitted nicotine concentrations to 20 mg/mL, increasing taxation on vaping products, and increasing the minimum age of purchase to 21.

¹For those specifying the exact range of nicotine concentration used in their device.

BACKGROUND

E-cigarette use (“vaping”) among youth and young adults is an epidemic. Between 2017 and 2018, vaping among Canadians aged 16 to 19 increased by 74% (1). This trajectory signifies a red alert state. 20% of Canadian students in grades 7 to 12 are current e-cigarette users, and 40% of those are daily/almost daily users (2). In response to these findings, the *2019 Youth and Young Adult Vaping Survey* was conducted by Smoke-Free Nova Scotia to better understand vaping behaviour among regular e-cigarette users between the ages of 16 and 24 in Nova Scotia. From these findings came the recommendation of five policy actions including a flavour ban, taxation, stronger enforcement of sales regulations, increasing the minimum legal age, and increasing awareness of the potential for vaping to translate into cigarette smoking.

Aim and Objectives

The aim of the *2020 Youth and Young Adult Vaping Project* is to better understand vaping behaviour, experiences, and product preferences among regular e-cigarette users between the ages of 16 and 24 across Canada. This project is meant to act as an extension of the *2019 Youth and Young Adult Vaping Survey* at a national level. This project was made possible through funding by Heart & Stroke.

METHODS

The vaping survey was pilot tested with 5 participants, revised, and then tested again with 5 volunteers to confirm that the questions were clear and that the length of the survey did not lead to participant fatigue. Further, the answers to the pilot surveys were examined to determine whether they contained meaningful and coherent responses.

A single, comprehensive, cross-sectional survey, in English, was used to generate a report to better understand the issue of vaping in Canada. Participants had to be between the ages of 16 and 24, to have vaped at least once a week over the past three months, and to reside in one of the regions of interest. The total sample consisted of 1871 respondents [1328 with complete responses from Ontario, Manitoba, Saskatchewan and Alberta combined (Prairies region), and British Columbia, plus 543 respondents with complete responses from the 2019 Nova Scotia survey].

Participants were recruited online using paid Facebook and Instagram ads targeted to their age and location. If they responded to the ad, they were directed to the survey landing page on Qualtrics (an online survey platform). Participants viewed an online informed consent document and were asked to provide their consent by responding “yes” or “no” to participate in the study. If they clicked “yes”, they were directed to complete the survey.

The survey included demographic questions, questions about the participants’ vaping behaviour, product preferences, experiences, a personality questionnaire, and a substance use motives questionnaire. On average, the survey took approximately 20 minutes to complete. Participants who completed the survey in its entirety were offered a \$10 electronic gift card to Starbucks as remuneration. Further, all participants were invited to share their email address to be entered to

win one of five \$100 gift cards from a prize draw, regardless as to whether they completed the survey.

Regional analyses were planned for British Columbia, Ontario, Manitoba, and the Prairies region (Saskatchewan and Alberta). Further, a total sample analysis of all participants was performed. The results of the data analyses will be synthesized and translated into various deliverables.

RESULTS

Demographic information

Table 1 depicts the demographic information for the sample segmented by region. The mean age of the sample was 18.44 years. The sample was evenly distributed in terms of both age and gender [youth (52.4%) and males (51.0%)]. Employed respondents were overrepresented in the sample as a whole (64.9%). Further, the majority of respondents identified as living in urban areas (86.8%). This was especially prevalent in British Columbia (93.0%).

Vaping behaviour

Table 2 reports vaping behaviour for all respondents. The average age of vaping onset among all respondents was 15.74 years. Of the 59.0% of respondents that reported a vaping quit attempt, the average number of serious quit attempts (those lasting for at least 24 hours) was 4.78. Respondents reported that they engaged in vaping behaviour an average of six days per week and almost 30 times per day, with approximately 6 puffs per episode. Vaping behaviour since learning about COVID-19 was measured and showed a difference in vaping frequency across the entire sample (averaging 5 days vaped per week, 19 vaping episodes per day, and less than 6 puffs per episode) compared to the period preceding the pandemic. Spending per week on vaping products varied by province, with the average across all regions being \$14.59. The strongest influence to start vaping for the whole sample was friends ($n = 1269$), followed by vaping as a smoking cessation method ($n = 310$) and social media exposure ($n = 96$). The overwhelming majority of the sample disclosed sharing behaviours in that they both had been offered to use someone else's e-cigarette (98.6%) as well as shared their own with others (93.0%). For those that have offered to share their e-cigarette, the average estimate for the number of people it was shared with was 22.93. Of the 62% of respondents that reported using pod-based devices, an average of 2.63 pods were used per week. Around half (50.3%) of all respondents reported experiencing negative side-effects related to vaping and 30.8% of respondents have been pressured by others to vape. 52.9% of youth reported that their parents were aware of their vaping behaviour. Social media advertisement exposure was prominent across the sample (74.0%). Instagram ($n = 515$), Snapchat ($n = 373$), and YouTube ($n = 299$) were the top three platforms of exposure, respectively.

Age/gender differences in vaping behaviour for the total sample

Table 2 reveals important differences in vaping behaviour for the total sample by age and gender. Male and female youth reported greater average numbers of quit attempts than male and female young adults, with male youth having the most (6.02). Female youth had the least number of

days vaped per week (5.55) and male young adults had the highest (6.22). Female young adults had the lowest number of vaping episodes per day (25.97), while male young adults had the highest (32.63). Female young adults also had the lowest number of puffs per episode (5.91), whereas female youth had the highest (6.81). Since learning about COVID-19, days vaped per week decreased most notably for male young adults (5.03), and vaping episodes per day decreased the most for this same group (18.56), while number of puffs per episode decreased the most for male youth (4.95) and, in fact, increased slightly for female young adults (6.37). Male youth (\$14.57) and young adults (\$17.73) spend more per week on vaping products on average than female youth and young adults, with male young adults spending the most. Female youth ($n = 397$) and young adults ($n = 249$) more frequently reported friends as the strongest influence to start vaping than male youth and young adults, whereas male young adults ($n = 131$) more frequently reported vaping as a smoking cessation method as being the strongest influence. Male and female youth reported sharing their vape with someone else (92.2% and 96.9%, respectively) and using someone else's vape (98.8% and 99.8%, respectively) slightly more often than male and female young adults. Male and female youth more often reported both social media (76.0% and 87.6%, respectively) and general advertisement ($n = 352$; $n = 410$) exposure than male and female young adults. Female youth most commonly reported negative side effects compared to the other groups (55.1%).

Regional differences in vaping behaviour for the total sample

Tables 3-7 depict the vaping behaviour of the sample for each province separately and segmented by age and gender. The days vaped per week was highest in the Prairies (6.33; Table 7), while the vaping episodes per day were highest in the Prairies as well (36.73; Table 7), and the number of puffs per episodes were highest in Nova Scotia (7.13; Table 5). After the onset of COVID-19, Ontario saw the largest decreases in days vaped per week (4.70; Table 6), whereas vaping episodes per day decreased the most for the Prairies (24.03; Table 7), and the number of puffs per episode decreased the most for British Columbia (5.30; Table 3).

The average spending per week on vaping products was lowest in British Columbia (\$12.92; Table 3) and highest in Nova Scotia (\$16.47; Table 5), with weekly averages being comparable in Manitoba (\$13.64), Ontario (\$15.33), and the Prairies (\$13.79) (Tables 4, 6, & 7, respectively).

Product information

Table 8 reports product information for all respondents. Regarding the type of device, pod-based devices that contain disposable cartridges of vape juice (e.g., JUUL) were the most common among all respondents (62.0%). Almost all users reported the use of flavoured vape juice at initiation (91.9%), as well as a preference for flavoured vape juice at present (90.4%). In most provinces, berry, mango, and mint/menthol were the most commonly reported flavours used at initiation and at present. In general, more than half (57.1%) of users claimed they would continue to vape if flavours were to be removed from vape juice. Of note is that 21% of respondents reported adding content as unintended by the product manufacturer (e.g., water) to their vape juice. Most respondents reported that they vape juice containing nicotine (91.5%), and, among those using nicotine, almost all knew the concentration of nicotine they used (97.5%). In terms of nicotine concentration, the majority of respondents reported using between 50-60 mg/mL of

nicotine (66.2%)². The primary mode of access to vaping products was through specialty vape shops in all regions except Ontario.

Age/gender differences in product information for the total sample

Table 8 shows the product information responses by age and gender for the total sample. The preference for flavours, although common in all groups, was most prevalent for female youth respondents (94.7%). Similarly, female youth (94.9%) and young adults (92.7%) more commonly reported the use of flavours at initiation than male youth and young adults. Female young adults most commonly responded that they would not continue to vape if flavours were to be removed from vape juice (52.6%), whereas male youth less commonly reported this (32.9%). Across all regions, male and female youth more commonly reported using nicotine concentrations between 50-60 mg/mL in their vape juice² (73.8% and 70.9%, respectively) than male and female young adults. Male (70.3%) and female (73.0%) young adults most commonly reported using nicotine at onset, whereas male (34.4%) and female (35.7%) youth more commonly reported the use of vape juice without nicotine. In general, female young adults more often used nicotine at onset, whereas female young adults less often used nicotine at onset. Social sourcing of vaping products was more prevalent among youth than young adults in all regions (Tables 9-10, 12-13).

Regional differences in product information for the total sample

Tables 9-13 depict product information for the sample separated by province and segmented by age and gender. Regarding regional differences, respondents in Nova Scotia more commonly reported that they would not continue to vape if flavours were removed from vape juice (48.8%; Table 11). Nova Scotia, Ontario, and the Prairies were the regions with the most respondents who reported using nicotine concentrations of 50-60 mg/mL² (70.3%, 69.5%, and 68.0%, respectively; Tables 11-13). Purchasing vaping products at retail outlets (e.g., convenience stores) was the most common mode of access in Ontario (Table 12).

Other substance use behaviour in total sample

Table 14 reports substance use behaviour besides vaping for all respondents. Approximately 64% of respondents were former tobacco users and 12% current users. The number of cigarettes smoked per week for current tobacco users ranged between 6-18 among all regions with an average of around 14. Most respondents (52.6%) with a history of tobacco use reported smoking before the onset of vaping, but a notable number of them reported tobacco initiation following vaping (27.7%). While many (64.7%) reported that they did not know anyone who began smoking after vaping, a notable proportion (35.3%) acknowledged having peers that first vaped and then began smoking. In the last 30 days, the number of days on which cannabis was used exceeded that of alcohol across all regions, with cannabis use averaging 12 days compared to 6 days of alcohol use. Regarding alcohol consumption, occasional drinkers made up most of the sample ($n = 539$), followed by light ($n = 312$) and moderate ($n = 199$) drinkers.

²For those specifying the exact range of nicotine concentration used in their device.

Age/gender differences in other substance use behaviour for the total sample

Table 14 reveals notable age and gender differences in other substance use behaviour for the total sample. On average, male youth (13.08 cigarettes/week) and young adults (20.90 cigarettes/week) reported greater cigarette smoking rates compared to female youth and young adults. Female youth most commonly reported no history of tobacco use (35.8%), whereas male young adults most commonly reported being former tobacco users (76.3%). Male youth made up the majority of the current tobacco user category (14.5%). Male (35.3%) and female (31.0%) youth most commonly reported tobacco use as beginning after the onset of vaping, whereas male (60.5%) and female (63.3) young adults most commonly reported tobacco use as preceding vaping. Cannabis use and alcohol use in the last 30 days were also higher on average amongst male (14.91 days and 8.22 days, respectively) and female (13.96 days and 7.25 days, respectively) young adults.

Regional differences in other substance use behaviour for the total sample

Tables 15-19 depict other substance use behaviour for the sample separated by province and segmented by age and gender. Nova Scotia had the highest levels of tobacco use overall (18.17 cigarettes/week; Table 17), whereas British Columbia reported the lowest (6.79 cigarettes/week; Table 15). British Columbia reported the highest levels of cannabis use (14.11 days; Table 15), whereas the Prairies reported the lowest levels (10.99 days; Table 19). In terms of alcohol consumption, Ontario reported the largest proportion of occasional drinkers ($n = 180$), British Columbia light drinkers ($n = 91$), and the Prairies moderate drinkers ($n = 64$) (Tables 18, 15, & 19, respectively).

DISCUSSION

The findings of this survey have generated evidence for numerous actions, policy and otherwise, that could reduce the prevalence of vaping among youth and young adults. Our findings identified notable regional differences in vaping behaviour, including differences in days vaped, vaping episodes per day, and puffs per episode. These differences call for varying levels of cessation strategies at a regional level, dependent on the frequency of vaping in that region. It is important to note that many respondents indicated a lower vaping frequency after learning about the COVID-19 pandemic, most notably in British Columbia and Ontario. This may be related to their higher socioeconomic status/level of education, which may in turn facilitate their receptivity to warnings related to potential complications from COVID-19 for e-cigarette users compared to non-users. Alternatively, it may reflect the active initiatives of the British Columbia Centre for Disease Control and the Ontario Tobacco Research Unit to warn consumers about vaping and COVID-19 complications (3,4).

The product information section of the survey produced consistent results across the sample with respect to high nicotine concentration, a preference for non-tobacco flavours, and the low cost of vaping. These findings highlight the need for three universal policies: Nicotine concentration caps, flavour bans, and higher taxation in all jurisdictions. Our findings suggest that not only do youth and young adult e-cigarette users use mostly nicotine-based products, but they most often choose products with high nicotine concentrations (50-60 mg/mL). The importance of this issue

cannot be overstated as our results show that youth males and females more commonly select vape juice with the highest available nicotine concentrations as compared to male and female young adults. This evidence culminates in the need for nicotine caps. The European Union precedent of 20 mg/mL, which will be introduced in Nova Scotia in 2020, can effectively address this issue (5).

Both the preference for and importance of non-tobacco flavours amongst youth and young adults is evident from their willingness to quit vaping if flavours were removed, especially among female young adults. These findings suggest that flavour bans are both important and likely to be very impactful in decreasing vaping behaviour within this demographic. This recommendation and set of findings are consistent with past literature that has demonstrated the importance of flavours, the reluctance to continue to vape in their absence, and the likely impact of a flavour ban on vaping behaviour in this demographic, underscoring the importance of flavour bans in reducing the appeal of vaping to young persons (6).

The average spending per week across the sample demonstrates the affordability of e-cigarettes in comparison to traditional cigarettes. On average, participants reported spending approximately \$15 per week on vaping, which is less than a single pack of cigarettes in most Canadian regions. Thus, we would expect a regular smoker who uses a half-pack of cigarettes per day to spend at least three times more than that per week. This minimal weekly spending warrants greater taxation on vaping products in all jurisdictions to decrease the affordability amongst this population, especially youth. Evidence on the effectiveness of taxation has been demonstrated with tobacco and alcohol products (7).

The prevalence of smoking and cannabis use within the sample demonstrates a pattern of co-use that exists between e-cigarettes and other substances. In Nova Scotia, the proportion of dual e-cigarette users and smokers far exceeds those of the other regions that were surveyed. Smoking is also more common on average among young adults in Manitoba and male young adults in the Prairies. Further, cannabis use is higher among young adults than youth across all regions. These results are consistent with past literature that demonstrates a link between e-cigarette, tobacco, and cannabis use amongst adolescents (8). These regions would benefit from a multi-faceted smoking cessation approach that targets substance co-use, focusing on young adults in particular. Smoking cessation strategies must target both traditional cigarettes and cannabis to be maximally effective in limiting their co-use with e-cigarettes.

The role of specialty vape shops in permitting underage access to vaping products is of upmost concern. It is clear from our findings that youth are either themselves or through an adult source acquiring vaping products through these outlets. Our results demonstrate that specialty vape shops are the primary means of purchase for both e-cigarettes and vape juice in all provinces except Ontario. Further, a sizeable portion of youth respondents in our survey disclosed purchasing their vaping products from these locations. Enforcement rights for peace officers and very high penalties for shops found in violation of minor sale compliance are needed. Also needed is a requirement for licensing to sell vaping products to easily track violators and implement an escalating penalty for each consecutive violation. The United States Surgeon General report on youth and young adult e-cigarette use provides support for giving individual jurisdictions the right to take action to regulate how sales to minors are policed (9).

A significant proportion of all respondents reported experiencing negative side-effects related to their e-cigarette use. The fact that our survey respondents reported negative-side effects is consistent with emerging literature on e-cigarette or vaping product use-associated lung injury (EVALI). Over 2800 hospitalizations have occurred in the United States due to EVALI as of February 2020. Of those experiencing EVALI, over half are under the age of 24. Vitamin E acetate has been identified as a key causal factor of EVALI and further efforts should be made to remove this substance from all vape juices. Further, the fact that our results demonstrate a similar proportion of respondents who reported both negative side-effects and the use of high levels of nicotine is consistent with the finding that over half of all EVALI patients are nicotine users (10). In all, this suggests that negative effects related to nicotine are possible, however this relationship requires further research.

The knowledge of someone who initiated smoking after using e-cigarettes was common among respondents, especially youth. This speaks to the existing literature that suggests regular e-cigarette users are five-times more likely than non-e-cigarette users to become regular smokers in the absence of any tobacco use history (11). This further strengthens the need for prevention efforts that are aimed at both youth and young adults to prevent the initiation of e-cigarette use and the subsequent use of traditional cigarettes.

A troublingly large percentage of parents of youth respondents are aware of their children's vaping behaviour. In general, around half of all youth surveyed reported that their parents were aware that they vape. Related to this point is access to vaping products through social sources. More youths than young adults in our sample reported purchasing their vaping supplies from a social source. This finding identifies friends as a notable access point and speaks to the need for increasing the legal age for purchasing vaping products to 21 years, effectively minimizing the opportunity for social sourcing amongst youth. This step has been taken in Prince Edward Island where the legal age has been raised to 21 years (12).

As it relates to advertisements, a notable percentage of all respondents in our sample reported being exposed to ads for vaping products on several mediums, most notably Instagram and Snapchat. This highlights the need to implement federal restrictions on social media content (both industry- and user-generated) that concerns vaping.

Pod-based devices such as JUUL were the most popular type of device used by our sample by a significant margin. This result is consistent with past literature that demonstrates how pod-based devices are appealing to adolescent e-cigarette users for reasons that include flavours, higher nicotine concentrations, and discreteness (14). The literature relating to pod-based devices further supports the need for flavour bans and nicotine caps as these elements have been identified as part of the appeal of these devices. The popularity of these devices calls for regulatory measures that limit their accessibility to young e-cigarette users, or at minimum, social marketing campaigns that target their popularity.

CONCLUSION

The *2020 Youth and Young Adult Vaping Survey* was conducted to better understand the vaping behaviour, experiences, and product preferences of youth and young adult e-cigarette users across several Canadian regions. The survey identified key differences that exist between provinces and within age and gender groups. Importantly, the survey identified key areas for policy and regulatory action to target the vaping epidemic in youth and young adults. Our study highlights the need for flavour bans to reduce the prevalence of vaping within this population by reducing the desirability of vaping to those who prefer flavours. Nicotine caps are needed to limit the addictive potential of e-cigarettes. Taxation and further regulatory measures aimed at specialty vape shops are needed to both deter youth and reduce the likelihood of them acquiring vaping products through this outlet. Raising the minimum age of purchase to 21 years will allow underage youth fewer opportunities to access vaping products through social sources. As is the case with traditional tobacco products, both prevention and cessation strategies must be employed alongside federal regulations concerning social media content and advertising to reduce the social acceptability of vaping, encourage youth and young adults to abstain from vaping, and prevent the onset of tobacco and cannabis use. In sum, e-cigarette use amongst youth and young adults represents a red alert state. This evidence must be taken into account and mobilized through proper resources and policies to reduce the use of e-cigarettes within this population.

LIMITATIONS

The findings of this project are subject to some limitations. Firstly, participants were all regular e-cigarette users (once a week/over the last 3 months) and thus our conclusions cannot be extended to infrequent or experimental e-cigarette users. Secondly, the survey was cross-sectional and thus cause-effect relationships cannot be determined. Thirdly, our study did not include several provinces and territories. However, a French-language version of the survey is being planned for Quebec residents.

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Table 1. Demographic information of youth and young adult e-cigarette users by region.

Variables	Region					
	British Columbia, <i>M (SD)</i>	Manitoba, <i>M (SD)</i>	Nova Scotia, <i>M (SD)</i>	Ontario, <i>M (SD)</i>	Prairies, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age	18.46 (1.93)	18.37 (2.03)	18.55 (2.22)	18.5 (1.91)	18.19 (1.79)	18.44 (2.00)

Variables	Region					
	British Columbia, <i>N (%)</i>	Manitoba, <i>N (%)</i>	Nova Scotia, <i>N (%)</i>	Ontario, <i>N (%)</i>	Prairies, <i>N (%)</i>	Total, <i>N (%)</i>
Age by category						
Youth (16-18)	159 (50.5)	146 (58.9)	302 (55.6)	198 (49.3)	212 (58.4)	980 (52.4)
Young adult (19-24)	156 (49.5)	102 (41.1)	241 (44.4)	204 (50.7)	151 (41.6)	891 (47.6)
Gender¹						
Male	161 (51.1)	122 (49.2)	286 (52.7)	201 (50.0)	185 (51.0)	955 (51.0)
Female	149 (47.3)	120 (48.4)	252 (46.4)	196 (48.8)	174 (47.9)	891 (47.6)
Other	5 (1.6)	6 (2.4)	5 (0.9)	5 (1.2)	4 (1.1)	25 (1.4)
Currently employed						
Yes	183 (58.1)	164 (66.1)	418 (77.0)	236 (58.7)	213 (58.7)	1214 (64.9)
No	132 (41.9)	84 (33.9)	125 (23.0)	166 (41.3)	150 (41.3)	657 (35.1)
Geographical location*²						
Rural	22 (7.0)	53 (21.4)	---	52 (12.9)	48 (13.3)	175 (13.2)
Urban	293 (93.0)	195 (78.6)	---	350 (87.1)	314 (86.7)	1152 (86.8)

Note. Prairies: Alberta (N = 208) and Saskatchewan (N = 155). *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses. ¹Respondents that selected gender as “other” were required to specify and were assigned to an appropriate age/gender category for the purpose of analyses. ²Question was not answered by all participants.

Table 2. *Vaping behaviour for the total sample.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.63 (1.50)	16.86 (2.00)	14.70 (1.21)	17.29 (2.01)	15.74 (2.06)
Number of serious quit attempts (>24 hours)	6.02 (30.12)	4.27 (5.58)	5.06 (15.83)	3.06 (2.89)	4.78 (18.71)
Days vaped per week	5.95 (1.94)	6.22 (1.67)	5.55 (2.11)	5.85 (1.96)	5.89 (1.94)
Vaping episodes per day	29.87 (32.19)	32.63 (32.55)	26.20 (29.87)	25.97 (30.04)	28.77 (31.33)
Number of puffs per episode	6.39 (5.59)	6.44 (5.55)	6.81 (5.37)	5.91 (4.53)	6.42 (5.33)
Since the onset of COVID-19*					
Days vaped per week	5.11 (2.52)	5.03 (2.41)	4.57 (2.56)	5.11 (2.32)	4.94 (2.47)
Vaping episodes per day	20.56 (28.57)	18.56 (25.45)	18.98 (28.94)	16.71 (22.96)	18.82 (26.80)
Number of puffs per episode	4.95 (4.79)	5.39 (5.55)	6.09 (5.76)	6.37 (6.03)	5.69 (5.54)
Number of people who have used your e-cigarette	31.38 (143.41)	24.69 (36.79)	18.74 (21.58)	15.38 (22.01)	22.93 (78.32)
Average spending per week on vaping products	14.57 (14.53)	17.73 (14.37)	12.02 (11.66)	13.22 (10.36)	14.59 (13.20)
Pods used per week (pod-based devices)*	2.69 (2.19)	3.28 (2.85)	2.23 (2.23)	2.36 (1.97)	2.63 (2.36)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses.

Table 2. Vaping behaviour for the total sample (continued).

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Ever tried to quit vaping					
Yes	241 (64.6)	188 (59.5)	196 (56.0)	159 (55.0)	1328 (59.0)
No	132 (35.4)	128 (40.5)	154 (44.0)	130 (45.0)	544 (41.0)
Strongest influence to start vaping¹					
Friends	364	259	397	249	1269
Wanting to quit smoking	66	131	40	73	310
Social media exposure	20	16	39	21	96
Negative side-effects²					
Yes	205 (46.5)	202 (49.5)	238 (55.1)	155 (49.8)	800 (50.3)
No	236 (53.5)	206 (50.5)	194 (44.9)	156 (50.2)	792 (49.7)
Pressure from others to vape					
Yes	167 (32.6)	136 (29.1)	169 (32.7)	105 (28.1)	577 (30.8)
No	345 (67.4)	332 (70.9)	348 (67.3)	269 (71.9)	1294 (69.2)
Offered to share your e-cigarette²					
Yes	451 (92.2)	411 (89.9)	470 (96.9)	340 (93.2)	1672 (93.0)
No	38 (7.8)	46 (10.1)	15 (3.1)	25 (6.8)	124 (7.0)
Have been offered to use someone else's e-cigarette					
Yes	506 (98.8)	453 (96.8)	516 (99.8)	369 (98.7)	1844 (98.6)
No	6 (1.2)	15 (3.2)	1 (0.2)	5 (1.3)	27 (1.4)
Parental knowledge of vaping behaviour^{2,3}					
Yes	245 (59.8)	---	207 (46.5)	---	452 (52.9)
No	165 (40.2)	---	238 (53.5)	---	403 (47.1)
Social media advertisement exposure					
Yes	389 (76.0)	272 (58.1)	453 (87.6)	270 (72.2)	1384 (74.0)
No	123 (24.0)	196 (41.9)	64 (12.4)	104 (27.8)	487 (26.0)
Top advertisement exposure platforms¹					
Instagram	154	120	157	84	515
Snapchat	108	78	144	43	373
YouTube	90	61	109	39	299
No exposure	258	265	255	215	993

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 3. *Vaping behaviour for British Columbia respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.44 (1.44)	16.68 (1.97)	14.53 (1.20)	17.08 (2.11)	15.65 (2.09)
Number of serious quit attempts (> 24 hours)	12.66 (65.21)	5.43 (7.38)	3.22 (2.78)	2.69 (1.79)	6.48 (36.11)
Days vaped per week	5.92 (1.96)	5.89 (2.00)	5.84 (1.85)	6.11 (1.80)	5.94 (1.90)
Vaping episodes per day	27.02 (32.00)	27.41 (29.78)	28.44 (29.46)	27.73 (30.51)	27.63 (30.36)
Number of puffs per episode	6.17 (5.46)	5.58 (4.79)	5.92 (4.21)	6.70 (4.53)	6.08 (4.79)
Since the onset of COVID-19					
Days vaped per week	5.22 (2.38)	4.56 (2.74)	4.46 (2.40)	5.22 (2.32)	4.90 (2.44)
Vaping episodes per day	18.13 (26.38)	13.93 (20.24)	13.69 (23.02)	15.56 (19.43)	15.57 (22.71)
Number of puffs per episode	4.46 (3.98)	6.04 (6.96)	4.90 (2.93)	6.25 (4.08)	5.30 (4.49)
Number of people who have used your e-cigarette	26.26 (31.44)	29.56 (39.86)	23.75 (27.69)	16.82 (22.84)	24.16 (31.25)
Average spending per week on vaping products	11.98 (13.29)	15.24 (13.85)	8.75 (7.94)	14.68 (9.39)	12.92 (11.78)
Pods used per week (pod-based devices)	2.57 (2.63)	2.86 (1.83)	2.00 (1.51)	2.38 (1.86)	2.48 (2.02)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 3. Vaping behaviour for British Columbia respondents (continued).

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Strongest influence to start vaping¹					
Friends	56	49	56	56	215
Quitting smoking	12	18	7	13	50
Social media exposure	3	3	7	0	13
Negative side-effects²					
Yes	37 (47.4)	39 (57.4)	40 (64.5)	32 (58.2)	148 (56.3)
No	41 (52.6)	29 (42.6)	22 (35.5)	23 (41.8)	115 (43.7)
Pressure from others to vape					
Yes	21 (24.4)	24 (30.0)	24 (32.0)	23 (31.1)	92 (29.2)
No	65 (75.6)	56 (60.0)	51 (68.0)	51 (68.9)	223 (70.8)
Offered to share your e-cigarette²					
Yes	82 (98.8)	70 (89.7)	71 (97.3)	71 (95.9)	294 (95.5)
No	1 (1.2)	8 (10.3)	2 (2.7)	3 (4.1)	14 (4.5)
Have used someone else's e-cigarette					
Yes	85 (98.8)	76 (95.0)	75 (100.0)	74 (100.0)	310 (98.4)
No	1 (1.2)	4 (5.0)	0 (0.0)	0 (0.0)	5 (1.6)
Parental knowledge of vaping behaviour^{2,3}					
Yes	34 (47.9)	---	30 (50.0)	---	64 (48.9)
No	37 (52.1)	---	30 (50.0)	---	67 (51.1)
Social media advertisement exposure					
Yes	65 (75.6)	49 (61.3)	65 (86.7)	54 (73.0)	233 (74.0)
No	21 (24.4)	31 (38.7)	10 (13.3)	20 (27.0)	82 (26.0)
Top advertisement exposure platforms¹					
Instagram	27	28	15	16	86
Billboards	21	17	16	15	69
Snapchat	18	15	19	9	61
No exposure	39	34	37	36	146

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 4. *Vaping behaviour for Manitoba respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.65 (1.51)	16.79 (2.23)	14.66 (1.22)	16.73 (2.05)	15.50 (2.00)
Number of serious quit attempts (> 24 hours)	4.48 (5.64)	4.76 (8.83)	3.97 (10.98)	4.36 (6.00)	4.36 (8.29)
Days vaped per week	6.08 (1.73)	6.45 (1.35)	6.22 (1.67)	6.11 (1.74)	6.21 (1.63)
Vaping episodes per day	35.43 (35.19)	36.16 (32.53)	33.87 (33.96)	28.73 (30.94)	33.93 (33.39)
Number of puffs per episode	6.56 (5.16)	6.41 (5.56)	7.64 (4.80)	7.45 (5.93)	7.02 (5.29)
Since the onset of COVID-19					
Days vaped per week	5.19 (2.53)	4.53 (2.59)	5.08 (2.55)	5.50 (1.92)	5.09 (2.44)
Vaping episodes per day	23.51 (31.36)	19.84 (30.46)	27.95 (33.08)	14.61 (21.10)	22.91 (30.35)
Number of puffs per episode	5.33 (4.82)	4.68 (5.49)	7.11 (5.68)	10.94 (10.41)	6.74 (6.65)
Number of people who have used your e-cigarette	21.22 (31.35)	18.00 (20.50)	19.01 (23.05)	16.79 (22.92)	19.06 (25.19)
Average spending per week on vaping products	12.87 (16.06)	18.72 (14.01)	13.58 (14.58)	8.80 (6.41)	13.64 (13.96)
Pods used per week (pod-based devices)	2.81 (2.05)	4.35 (4.26)	2.50 (1.85)	1.63 (1.61)	2.88 (2.67)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 4. *Vaping behaviour for Manitoba respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Strongest influence to start vaping¹					
Friends	54	25	57	27	163
Quitting smoking	7	21	6	8	42
Social media exposure	1	3	5	3	12
Negative side-effects²					
Yes	32 (51.6)	21 (42.3)	38 (60.3)	19 (54.3)	110 (52.6)
No	30 (48.4)	28 (57.7)	25 (39.7)	16 (45.7)	99 (47.4)
Pressure from others to vape					
Yes	23 (31.9)	6 (10.7)	18 (23.7)	8 (18.2)	55 (22.2)
No	49 (68.1)	50 (89.3)	58 (72.3)	36 (81.8)	193 (77.8)
Offered to share your e-cigarette²					
Yes	65 (92.3)	45 (81.8)	72 (97.3)	39 (90.7)	221 (91.3)
No	5 (7.7)	10 (18.2)	2 (2.7)	4 (9.3)	21 (8.7)
Have used someone else's e-cigarette					
Yes	72 (100.0)	51 (91.1)	76 (100.0)	43 (97.7)	242 (97.6)
No	0 (0.0)	5 (8.9)	0 (0.0)	1 (2.3)	6 (2.4)
Parental knowledge of vaping behaviour^{2,3}					
Yes	31 (56.4)	---	30 (46.2)	---	61 (50.8)
No	24 (43.6)	---	35 (53.8)	---	59 (49.2)
Social media advertisement exposure					
Yes	53 (73.6)	23 (41.1)	64 (84.2)	30 (68.2)	170 (68.5)
No	19 (26.4)	33 (58.9)	12 (15.8)	14 (31.8)	78 (31.5)
Top advertisement exposure platforms¹					
Instagram	25	8	21	7	61
YouTube	13	7	16	4	40
Snapchat	11	9	14	3	37
No exposure	45	40	44	35	164

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 5. *Vaping behaviour for Nova Scotia respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.81 (1.63)	17.36 (2.01)	15.05 (1.19)	18.09 (1.99)	16.11 (2.16)
Number of serious quit attempts (> 24 hours)	5.34 (14.03)	3.22 (3.71)	6.80 (22.55)	2.36 (1.62)	4.81 (14.65)
Days vaped per week	5.53 (2.29)	6.05 (1.88)	4.67 (2.42)	4.93 (2.40)	5.32 (2.31)
Vaping episodes per day	27.91 (31.71)	29.79 (32.03)	16.99 (22.14)	15.82 (22.92)	23.21 (28.51)
Number of puffs per episode	7.57 (7.07)	7.63 (6.78)	7.30 (5.89)	5.24 (3.33)	7.13 (6.21)
Since the onset of COVID-19*					
Days vaped per week	---	---	---	---	---
Vaping episodes per day	---	---	---	---	---
Number of puffs per episode	---	---	---	---	---
Number of people who have used your e-cigarette	50.89 (277.50)	19.17 (28.46)	14.59 (15.06)	9.04 (7.69)	24.19 (140.76)
Average spending per week on vaping products	15.45 (11.21)	19.06 (12.95)	15.12 (10.50)	13.77 (11.06)	16.47 (11.87)
Pods used per week (pod-based devices)*	---	---	---	---	---

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses.

Table 5. *Vaping behaviour for Nova Scotia respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Strongest influence to start vaping¹					
Friends	97	72	121	51	341
Wanting to quit smoking	20	54	20	22	116
Social media exposure	9	5	16	9	39
Negative side-effects²					
Yes	49 (35.3)	54 (35.5)	60 (35.9)	29 (34.1)	192 (35.4)
No	71 (51.2)	80 (52.6)	78 (46.7)	46 (54.1)	275 (50.6)
Not sure	19 (13.5)	18 (11.9)	29 (17.4)	10 (11.8)	76 (14.0)
Pressure from others to vape					
Yes	42 (30.2)	42 (27.6)	58 (34.7)	30 (35.3)	172 (31.7)
No	97 (69.8)	110 (72.4)	109 (65.3)	55 (64.7)	371 (68.3)
Offered to share your e-cigarette²					
Yes	117 (93.6)	134 (91.8)	141 (97.2)	72 (92.3)	464 (85.5)
No	8 (6.4)	12 (8.2)	4 (2.8)	6 (7.7)	30 (5.5)
Have used someone else's e-cigarette					
Yes	137 (98.6)	149 (98.0)	166 (99.4)	93 (97.6)	535 (98.5)
No	2 (1.4)	3 (2.0)	1 (0.6)	2 (2.4)	8 (1.5)
Parental knowledge of vaping behaviour^{2,3}					
Yes	70 (64.2)	---	65 (43.9)	---	135 (52.5)
No	39 (35.8)	---	83 (56.1)	---	122 (47.5)
Social media advertisement exposure					
Yes	113 (81.3)	93 (61.2)	152 (91.0)	69 (81.2)	427 (78.6)
No	26 (18.7)	59 (38.8)	15 (9.0)	16 (18.8)	116 (21.4)
Top advertisement exposure platforms¹					
Instagram	36	36	50	22	144
Snapchat	29	22	43	10	104
YouTube	23	15	33	10	81
No exposure	72	94	89	50	305

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 6. *Vaping behaviour for Ontario respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.58 (1.55)	16.65 (1.77)	14.63 (1.16)	17.33 (1.89)	15.79 (2.02)
Number of serious quit attempts (> 24 hours)	4.79 (7.69)	4.20 (4.03)	4.29 (6.60)	2.90 (1.91)	4.11 (5.69)
Days vaped per week	6.03 (1.80)	6.37 (1.45)	5.60 (1.95)	6.02 (1.75)	6.01 (1.76)
Vaping episodes per day	24.65 (28.47)	30.78 (31.72)	25.15 (27.89)	26.39 (30.50)	26.73 (29.67)
Number of puffs per episode	5.51 (4.28)	6.23 (5.13)	5.50 (4.14)	5.36 (4.38)	5.65 (4.49)
Since the onset of COVID-19					
Days vaped per week	4.65 (2.70)	4.93 (2.41)	4.26 (2.65)	4.91 (2.46)	4.70 (2.55)
Vaping episodes per day	12.59 (18.01)	16.65 (23.03)	14.19 (24.30)	15.54 (21.81)	14.79 (21.80)
Number of puffs per episode	4.33 (3.43)	5.83 (5.58)	5.43 (5.71)	5.33 (5.07)	5.23 (5.02)
Number of people who have used your e-cigarette	26.74 (30.57)	28.85 (45.55)	17.21 (20.86)	17.89 (27.66)	22.71 (32.72)
Average spending per week on vaping products	17.06 (18.06)	17.41 (16.21)	11.09 (11.92)	14.62 (11.33)	15.33 (14.94)
Pods used per week (pod-based devices)	2.43 (1.95)	3.38 (3.20)	2.12 (2.95)	2.25 (1.52)	2.53 (2.51)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 6. *Vaping behaviour for Ontario respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Strongest influence to start vaping¹					
Friends	73	61	80	67	281
Quitting smoking	15	22	3	17	57
Social media exposure	3	3	5	5	16
Negative side-effects²					
Yes	49 (56.3)	47 (53.4)	50 (63.3)	45 (53.6)	191 (56.5)
No	38 (43.7)	41 (46.6)	29 (36.7)	39 (46.4)	147 (43.5)
Pressure from others to vape					
Yes	34 (32.1)	28 (28.0)	35 (36.5)	23 (23.0)	120 (29.9)
No	72 (67.9)	72 (72.0)	61 (63.5)	77 (77.0)	282 (70.1)
Offered to share your e-cigarette²					
Yes	94 (89.5)	91 (91.9)	90 (96.8)	92 (92.9)	367 (92.7)
No	11 (10.5)	8 (8.1)	3 (3.2)	7 (7.1)	29 (7.3)
Have used someone else's e-cigarette					
Yes	106 (100.0)	97 (97.0)	96 (100.0)	99 (99.0)	398 (99.0)
No	0 (0.0)	3 (3.0)	0 (0.0)	1 (1.0)	4 (1.0)
Parental knowledge of vaping behaviour^{2,3}					
Yes	48 (57.1)	---	28 (34.6)	---	76 (46.1)
No	36 (42.9)	---	53 (65.4)	---	89 (53.9)
Social media advertisement exposure					
Yes	84 (79.2)	59 (59.0)	87 (90.6)	70 (70.0)	300 (74.6)
No	22 (20.8)	41 (41.0)	9 (9.4)	30 (30.0)	102 (25.4)
Top advertisement exposure platforms¹					
Instagram	27	28	34	29	118
Snapchat	22	20	33	16	91
Posters	21	18	16	29	84
No exposure	53	55	39	47	194

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 7. Vaping behaviour for Prairies respondents.

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Age of onset	14.59 (1.27)	16.40 (1.93)	14.34 (1.15)	16.82 (1.82)	15.35 (1.86)
Number of serious quit attempts (> 24 hours)	3.19 (2.22)	4.15 (4.52)	6.41 (22.53)	3.35 (2.80)	4.24 (11.50)
Days vaped per week	6.32 (1.62)	6.54 (1.20)	6.18 (1.70)	6.30 (1.59)	6.33 (1.55)
Vaping episodes per day	35.98 (33.34)	43.10 (35.35)	34.47 (35.27)	33.99 (33.23)	36.73 (34.36)
Number of puffs per episode	5.81 (4.79)	5.34 (3.46)	7.29 (6.38)	5.73 (4.77)	6.11 (5.09)
Since the onset of COVID-19					
Days vaped per week	5.37 (2.47)	5.85 (1.84)	4.57 (2.61)	5.12 (2.35)	5.19 (2.40)
Vaping episodes per day	28.38 (34.59)	24.27 (29.16)	21.20 (32.96)	21.25 (29.27)	24.03 (31.86)
Number of puffs per episode	5.73 (6.34)	4.67 (4.21)	6.93 (7.37)	5.78 (5.22)	5.87 (6.08)
Number of people who have used your e-cigarette	23.38 (30.78)	29.24 (41.69)	22.28 (23.04)	16.39 (21.56)	22.92 (30.14)
Average spending per week on vaping products	14.12 (13.17)	17.74 (15.06)	11.34 (11.61)	11.95 (10.75)	13.79 (12.97)
Pods used per week (pod-based devices)	2.94 (2.19)	2.95 (1.97)	2.32 (1.84)	2.80 (2.82)	2.75 (2.20)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 7. Vaping behaviour for Prairies respondents (continued).

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Strongest influence to start vaping¹					
Friends	84	52	85	48	269
Quitting smoking	12	16	4	13	45
Social media exposure	4	2	6	4	16
Negative side-effects²					
Yes	38 (40.4)	41 (59.4)	50 (55.6)	30 (48.4)	159 (50.5)
No	56 (59.6)	28 (40.6)	40 (44.4)	32 (51.6)	156 (49.5)
Pressure from others to vape					
Yes	47 (43.1)	36 (45.0)	34 (33.0)	21 (29.6)	138 (38.0)
No	62 (56.9)	44 (55.0)	69 (67.0)	50 (70.4)	225 (62.0)
Offered to share your e-cigarette²					
Yes	93 (87.7)	71 (89.9)	96 (96.0)	66 (93.0)	326 (89.3)
No	13 (12.3)	8 (10.1)	4 (4.0)	5 (7.0)	30 (10.7)
Have used someone else's e-cigarette					
Yes	106 (97.2)	80 (100.0)	103 (100.0)	70 (98.6)	359 (98.9)
No	3 (2.8)	0 (0.0)	0 (0.0)	1 (1.4)	4 (1.1)
Parental knowledge of vaping behaviour^{2,3}					
Yes	62 (68.1)	---	54 (59.3)	---	116 (63.7)
No	29 (31.9)	---	37 (40.7)	---	66 (36.3)
Social media advertisement exposure					
Yes	74 (67.9)	48 (60.0)	85 (82.5)	47 (66.2)	254 (70.0)
No	35 (32.1)	32 (40.0)	18 (17.5)	24 (33.8)	109 (30.0)
Top advertisement exposure platforms¹					
Instagram	39	20	37	10	106
Snapchat	28	12	35	5	80
YouTube	25	8	29	3	65
No exposure	49	42	46	47	184

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported. ²Question was not answered by all participants. ³Question not asked to young adults.

Table 8. *Product information for the total sample.*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Type of e-cigarette					
Cig-a-like	2 (0.4)	8 (1.7)	3 (0.6)	4 (1.1)	17 (.90)
Vape pen	89 (17.4)	77 (16.5)	118 (22.8)	74 (19.8)	358 (19.1)
Mod	81 (15.8)	97 (20.7)	87 (16.8)	71 (19.0)	336 (18.0)
Pod	340 (66.4)	286 (61.1)	309 (59.8)	225 (60.1)	1160 (62.0)
Currently prefer flavoured vape juices¹					
Yes	434 (88.6)	397 (87.8)	461 (94.7)	327 (90.3)	1619 (90.4)
No	56 (11.4)	55 (12.2)	26 (5.3)	35 (9.7)	172 (9.6)
Used flavoured vape juice at initiation*					
Yes	335 (89.8)	285 (90.2)	332 (94.9)	268 (92.7)	1220 (91.9)
No	38 (10.2)	31 (9.8)	18 (5.1)	21 (7.3)	108 (8.1)
Would you vape if you could not buy flavoured juices?¹					
Yes	291 (67.1)	221 (55.7)	257 (55.7)	155 (47.4)	924 (57.1)
No	143 (32.9)	176 (44.3)	204 (44.3)	172 (52.6)	695 (42.9)
Content added to vape juice					
Yes	132 (25.8)	91 (19.4)	130 (25.1)	40 (10.7)	393 (21.0)
No	380 (74.2)	377 (80.6)	387 (74.9)	334 (89.3)	1478 (79.0)
Nicotine concentration¹					
10-20 mg/mL	24 (5.5)	53 (13.9)	36 (8.3)	40 (13.7)	153 (10.0)
35 mg/mL	90 (20.7)	103 (27.1)	90 (20.8)	84 (28.7)	367 (23.8)
50-60 mg/mL	321 (73.8)	224 (59.0)	306 (70.9)	169 (57.6)	1020 (66.2)
Vaping product content at onset*					
Vape juice with nicotine	235 (63.0)	222 (70.3)	222 (63.4)	211 (73.0)	890 (67.0)
Vape juice without nicotine	128 (34.4)	79 (25.0)	125 (35.7)	65 (22.5)	397 (29.9)
Dry cannabis	5 (1.3)	8 (2.5)	1 (0.3)	4 (1.4)	18 (1.4)
Liquid cannabis	5 (1.3)	7 (2.2)	2 (0.6)	9 (3.1)	23 (1.7)
Vaping product content at present					
Vape juice with nicotine	476 (93.0)	434 (92.7)	467 (90.3)	329 (88.0)	1706 (91.5)
Vape juice without nicotine	13 (2.5)	9 (1.9)	30 (5.8)	17 (4.5)	69 (3.7)
Dry cannabis	6 (1.2)	6 (1.3)	2 (0.4)	4 (1.1)	18 (.96)
Liquid cannabis	15 (2.9)	17 (3.6)	16 (3.1)	24 (6.4)	72 (3.9)
Know nicotine content¹					
Yes	464 (97.5)	430 (99.1)	458 (98.1)	311 (94.5)	1663 (97.5)
No	12 (2.5)	4 (0.9)	9 (1.9)	18 (5.5)	43 (2.5)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses. ¹Question not answered by all participants.

Table 9. Product information for British Columbia respondents.

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Type of e-cigarette					
Cig-a-like	0 (0.0)	0 (0.0)	1 (1.3)	0 (0.0)	1 (0.3)
Vape pen	26 (30.2)	19 (23.8)	22 (29.3)	22 (29.7)	89 (28.3)
Mod	13 (15.1)	11 (13.8)	12 (16.0)	12 (16.2)	48 (15.2)
Pod	47 (54.7)	50 (62.5)	40 (53.3)	40 (54.1)	177 (56.2)
Currently prefer flavoured vape juices¹					
Yes	70 (86.4)	67 (84.8)	61 (87.1)	66 (92.3)	264 (87.7)
No	11 (13.6)	12 (15.2)	9 (12.9)	5 (7.7)	37 (12.3)
Used flavoured vape juice at initiation					
Yes	70 (81.4)	70 (87.5)	70 (93.3)	68 (91.9)	278 (88.3)
No	16 (18.6)	10 (12.5)	5 (6.7)	6 (8.1)	37 (11.7)
Most used flavour at initiation					
Berry	21 (30.4)	19 (27.1)	22 (29.3)	29 (41.4)	91 (32.0)
Confectionary	7 (10.1)	8 (11.4)	5 (6.7)	6 (8.6)	26 (9.2)
Mango	14 (20.3)	16 (22.9)	14 (18.7)	15 (21.4)	59 (20.8)
Menthol	8 (11.6)	11 (15.7)	8 (10.7)	6 (8.6)	33 (11.6)
Tobacco	1 (1.4)	1 (1.4)	0 (0.0)	1 (1.4)	3 (1.1)
Other	18 (26.1)	15 (21.4)	26 (34.7)	13 (18.6)	72 (25.4)
Most used flavour at present					
Berry	21 (31.3)	11 (18.0)	18 (27.3)	19 (27.5)	69 (26.2)
Confectionary	1 (1.5)	6 (9.8)	1 (1.5)	7 (10.1)	15 (5.7)
Mango	17 (25.4)	9 (14.8)	16 (24.2)	12 (17.4)	54 (20.5)
Menthol	10 (14.9)	17 (27.9)	11 (16.7)	16 (23.2)	54 (20.5)
Tobacco	3 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.1)
Other	15 (22.4)	18 (29.5)	20 (30.3)	15 (21.7)	68 (25.9)
Would you vape if you could not buy flavoured juices?¹					
Yes	51 (72.9)	44 (65.7)	39 (63.9)	33 (50.0)	167 (63.3)
No	19 (27.1)	23 (34.3)	22 (36.1)	33 (50.0)	97 (36.7)
Content added to vape juice					
Yes	16 (18.6)	15 (18.8)	15 (20.0)	4 (5.4)	50 (15.9)
No	70 (81.4)	65 (81.2)	60 (80.0)	70 (94.6)	265 (84.1)
Nicotine concentration¹					
10-20 mg/mL	6 (8.3)	10 (14.5)	4 (5.8)	15 (25.0)	35 (13.0)
35 mg/mL	16 (22.2)	24 (34.8)	20 (29.0)	19 (31.7)	79 (29.3)
50-60 mg/mL	50 (69.5)	35 (50.7)	45 (65.2)	26 (43.3)	156 (57.8)
Vaping product content at onset					
Vape juice with nicotine	54 (62.8)	60 (75.0)	42 (56.0)	56 (75.7)	212 (67.3)
Vape juice without nicotine	30 (34.9)	16 (20.0)	33 (44.0)	15 (20.2)	94 (29.8)
Dry cannabis	1 (1.1)	2 (2.5)	0 (0.0)	0 (0.0)	3 (1.0)
Liquid cannabis	1 (1.2)	2 (2.5)	0 (0.0)	3 (4.1)	6 (1.9)

Vaping product content at present

Vape juice with nicotine	78 (90.7)	75 (93.8)	70 (93.3)	67 (90.5)	290 (92.4)
Vape juice without nicotine	1 (1.2)	1 (1.2)	2 (2.7)	3 (4.1)	7 (2.2)
Dry cannabis	1 (1.2)	1 (1.2)	0 (0.0)	1 (1.3)	3 (1.0)
Liquid cannabis	5 (5.8)	3 (3.8)	3 (4.0)	3 (4.1)	14 (4.5)

Know nicotine content¹

Yes	78 (100.0)	75 (100.0)	70 (100.0)	65 (97.0)	288 (99.3)
No	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.0)	2 (0.7)

Device purchase location²

Specialty vape shop	27	49	13	54	143
From a friend	36	13	38	16	103
Retail location	17	29	7	22	75

Juice purchase location²

Specialty vape shop	26	49	13	56	144
From a friend	36	5	44	9	94
Retail location	21	33	5	20	79

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 10. *Product information for Manitoba respondents.*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Type of e-cigarette					
Cig-a-like	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Vape pen	18 (25.0)	20 (35.7)	18 (23.7)	12 (27.2)	68 (27.4)
Mod	17 (23.6)	10 (17.9)	16 (21.1)	16 (36.4)	59 (23.8)
Pod	37 (51.4)	26 (46.4)	42 (55.2)	16 (36.4)	121 (48.8)
Currently prefer flavoured vape juices¹					
Yes	64 (90.1)	47 (87.0)	67 (97.1)	40 (93.0)	218 (92.0)
No	7 (9.9)	7 (13.0)	2 (2.9)	3 (7.0)	19 (8.0)
Used flavoured vape juice at initiation					
Yes	68 (94.4)	47 (83.9)	74 (97.4)	41 (93.2)	230 (92.7)
No	4 (5.6)	9 (16.1)	2 (2.6)	3 (6.8)	18 (7.3)
Most used flavour at initiation					
Berry	14 (20.6)	6 (13.0)	28 (37.8)	13 (28.3)	61 (26.1)
Confectionary	11 (16.2)	9 (19.6)	11 (14.9)	5 (10.9)	36 (15.4)
Mango	3 (4.4)	9 (19.6)	5 (6.8)	7 (15.2)	24 (10.3)
Menthol	9 (13.2)	5 (10.9)	7 (9.5)	3 (6.5)	24 (10.3)
Tobacco	5 (7.4)	3 (6.5)	0 (0.0)	0 (0.0)	8 (3.4)
Other	26 (38.2)	14 (30.4)	23 (31.1)	18 (39.1)	81 (34.6)
Most used flavour at present					
Berry	18 (27.3)	15 (31.3)	16 (21.1)	15 (34.9)	64 (27.5)
Confectionary	3 (4.5)	4 (8.3)	9 (11.8)	5 (11.6)	21 (9.0)
Mango	11 (16.7)	8 (16.7)	11 (14.5)	4 (9.3)	34 (14.6)
Menthol	13 (19.7)	7 (14.6)	13 (17.1)	4 (9.3)	37 (15.9)
Tobacco	0 (0.0)	0 (0.0)	1 (1.3)	0 (0.0)	1 (0.4)
Other	21 (31.8)	14 (29.2)	26 (34.2)	15 (34.9)	76 (32.6)
Would you vape if you could not buy flavoured juices?¹					
Yes	37 (57.8)	30 (63.8)	45 (67.2)	17 (42.5)	129 (59.2)
No	27 (42.2)	17 (36.2)	22 (32.8)	23 (57.5)	89 (40.8)
Content added to vape juice					
Yes	20 (27.8)	9 (16.1)	23 (30.3)	6 (13.6)	58 (23.4)
No	52 (72.2)	47 (83.9)	53 (69.7)	38 (82.4)	190 (76.6)
Nicotine concentration¹					
10-20 mg/mL	4 (6.7)	11 (24.4)	5 (7.6)	9 (26.5)	29 (14.1)
35 mg/mL	18 (30.0)	14 (31.1)	14 (21.2)	5 (14.7)	51 (24.9)
50-60 mg/mL	38 (63.3)	20 (44.5)	47 (71.2)	20 (58.8)	125 (61.0)
Vaping product content at onset					
Vape juice with nicotine	40 (55.6)	38 (67.9)	48 (63.2)	33 (75.0)	159 (64.1)
Vape juice without nicotine	29 (40.3)	15 (26.8)	28 (36.8)	9 (20.4)	81 (32.7)
Dry cannabis	2 (2.8)	2 (3.6)	0 (0.0)	1 (2.3)	5 (2.0)
Liquid cannabis	1 (1.3)	1 (1.7)	0 (0.0)	1 (2.3)	3 (1.2)

Vaping product content at present

Vape juice with nicotine	66 (91.7)	52 (92.9)	72 (94.8)	39 (88.6)	229 (92.3)
Vape juice without nicotine	3 (4.2)	2 (3.5)	2 (2.6)	1 (2.3)	8 (3.2)
Dry cannabis	2 (2.8)	1 (1.8)	1 (1.3)	0 (0.0)	4 (1.6)
Liquid cannabis	1 (1.3)	1 (1.8)	1 (1.3)	4 (9.1)	7 (2.8)

Know nicotine content¹

Yes	65 (98.5)	51 (98.1)	70 (97.2)	38 (97.4)	224 (97.8)
No	1 (1.5)	1 (1.9)	2 (2.8)	1 (2.6)	5 (2.2)

Device purchase location²

Specialty vape shop	19	44	20	31	114
From a friend	32	7	33	3	75
From someone else	15	4	18	3	40

Juice purchase location²

Specialty vape shop	29	44	24	32	129
From a friend	30	2	36	3	71
Retail location	6	12	5	7	30

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 11. *Product information for Nova Scotia respondents.*

Variables	Male youth, <i>N</i> (%)	Male young adults, <i>N</i> (%)	Female youth, <i>N</i> (%)	Female young adults, <i>N</i> (%)	Total, <i>N</i> (%)
Type of e-cigarette					
Cig-a-like	0 (0.0)	4 (2.6)	0 (0.0)	1 (1.2)	5 (0.9)
Vape pen	7 (5.0)	12 (7.9)	32 (19.1)	14 (16.5)	65 (12.0)
Mod	27 (19.5)	39 (25.7)	37 (22.2)	21 (24.7)	124 (22.8)
Pod	105 (75.5)	97 (63.8)	98 (58.7)	49 (57.6)	349 (64.3)
Currently prefer flavoured vape juices¹					
Yes	125 (93.3)	134 (90.5)	161 (98.8)	76 (90.5)	496 (93.8)
No	9 (6.7)	14 (9.5)	2 (1.2)	8 (9.5)	33 (6.2)
Used flavoured vape juice at initiation*					
Yes	---	---	---	---	---
No	---	---	---	---	---
Most used flavour at initiation*					
Berry	---	---	---	---	---
Confectionary	---	---	---	---	---
Mango	---	---	---	---	---
Menthol	---	---	---	---	---
Tobacco	---	---	---	---	---
Other	---	---	---	---	---
Most used flavour at present*					
Berry	---	---	---	---	---
Confectionary	---	---	---	---	---
Mango	---	---	---	---	---
Menthol	---	---	---	---	---
Tobacco	---	---	---	---	---
Other	---	---	---	---	---
Would you vape if you could not buy flavoured juices?¹					
Yes	82 (65.6)	61 (45.5)	77 (47.8)	34 (44.7)	254 (51.2)
No	43 (34.4)	73 (54.5)	84 (52.2)	42 (55.3)	242 (48.8)
Content added to vape juice					
Yes	38 (27.3)	34 (22.4)	39 (23.4)	12 (14.1)	123 (22.7)
No	101 (72.7)	118 (77.6)	128 (76.6)	73 (85.9)	420 (77.3)
Nicotine concentration¹					
10-20 mg/mL	6 (5.1)	13 (10.6)	12 (9.4)	3 (5.1)	34 (7.9)
35 mg/mL	19 (16.1)	32 (26.0)	24 (18.8)	18 (30.5)	93 (21.7)
50-60 mg/mL	93 (78.8)	78 (63.4)	92 (71.8)	38 (64.4)	301 (70.3)
Vaping product content at onset*					
Vape juice with nicotine	---	---	---	---	---
Vape juice without nicotine	---	---	---	---	---
Dry cannabis	---	---	---	---	---
Liquid cannabis	---	---	---	---	---

Vaping product content at present

Vape juice with nicotine	131 (94.2)	139 (91.4)	142 (85.0)	70 (82.4)	482 (89.3)
Vape juice without nicotine	4 (2.9)	2 (1.3)	20 (12.0)	7 (8.2)	33 (6.1)
Dry cannabis	1 (0.7)	4 (2.6)	1 (0.6)	2 (2.4)	8 (1.5)
Liquid cannabis	2 (1.4)	6 (3.9)	3 (1.8)	6 (7.0)	17 (3.1)

Know nicotine content¹

Yes	125 (95.4)	138 (99.3)	137 (96.5)	62 (88.6)	462 (95.9)
No	6 (4.6)	1 (0.7)	5 (3.5)	8 (11.4)	20 (4.1)

Device purchase location*

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Juice purchase location*

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Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses. ¹Question not answered by all participants.

Table 12. *Product information for Ontario respondents.*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Type of e-cigarette					
Cig-a-like	1 (0.9)	3 (3.0)	2 (2.1)	2 (2.0)	8 (2.0)
Vape pen	20 (18.9)	7 (7.0)	15 (15.6)	8 (8.0)	50 (12.4)
Mod	11 (10.4)	21 (21.0)	8 (8.3)	13 (13.0)	53 (13.2)
Pod	74 (69.8)	69 (69.0)	71 (74.0)	77 (77.0)	291 (72.4)
Currently prefer flavoured vape juices¹					
Yes	88 (87.1)	77 (82.8)	85 (95.5)	84 (86.6)	334 (88.2)
No	13 (12.9)	16 (17.2)	4 (4.5)	13 (13.4)	46 (11.8)
Used flavoured vape juice at initiation					
Yes	100 (94.3)	93 (93.0)	91 (94.8)	90 (90.0)	374 (93.0)
No	6 (5.7)	7 (7.0)	5 (5.2)	10 (10.0)	28 (7.0)
Most used flavour at initiation					
Berry	26 (25.5)	28 (33.3)	36 (38.7)	32 (31.7)	122 (32.1)
Confectionary	15 (14.7)	16 (19.0)	14 (15.1)	14 (13.9)	59 (15.5)
Mango	18 (17.6)	8 (9.5)	14 (15.1)	15 (14.9)	55 (14.5)
Menthol	11 (10.8)	8 (9.5)	7 (7.5)	18 (17.8)	44 (11.6)
Tobacco	1 (1.0)	1 (1.2)	0 (0.0)	2 (2.0)	4 (1.1)
Other	31 (30.4)	23 (27.4)	22 (23.7)	20 (19.8)	96 (25.3)
Most used flavour at present					
Berry	30 (30.9)	14 (18.9)	30 (32.6)	22 (25.3)	96 (27.4)
Confectionary	7 (7.2)	3 (4.1)	4 (4.3)	8 (9.2)	22 (6.3)
Mango	12 (12.4)	17 (23.0)	19 (20.7)	10 (11.5)	58 (16.6)
Menthol	13 (13.4)	19 (25.7)	11 (12.0)	29 (33.3)	72 (20.6)
Tobacco	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)
Other	34 (35.1)	21 (28.4)	28 (30.4)	18 (20.7)	101 (28.9)
Would you vape if you could not buy flavoured juices?¹					
Yes	59 (67.0)	45 (58.4)	45 (52.9)	46 (54.8)	195 (58.4)
No	29 (33.0)	32 (41.6)	40 (47.1)	38 (45.2)	139 (41.6)
Content added to vape juice					
Yes	31 (29.2)	14 (14.0)	21 (21.9)	16 (16.0)	82 (20.4)
No	75 (70.8)	86 (86.0)	75 (78.1)	84 (84.0)	320 (79.6)
Nicotine concentration¹					
10-20 mg/mL	4 (4.4)	9 (11.3)	8 (11.0)	7 (9.0)	28 (8.7)
35 mg/mL	15 (16.7)	17 (21.3)	14 (19.2)	24 (30.8)	70 (21.8)
50-60 mg/mL	71 (78.9)	54 (67.4)	51 (69.8)	47 (60.2)	223 (69.5)
Vaping product content at onset					
Vape juice with nicotine	68 (64.2)	70 (70.0)	67 (69.8)	64 (64.0)	269 (66.9)
Vape juice without nicotine	33 (31.1)	25 (25.0)	27 (28.2)	29 (29.0)	114 (28.4)
Dry cannabis	2 (1.9)	4 (4.0)	1 (1.0)	2 (2.0)	9 (2.2)
Liquid cannabis	3 (2.8)	1 (1.0)	1 (1.0)	5 (5.0)	10 (2.5)

Vaping product content at present

Vape juice with nicotine	97 (91.5)	94 (94.0)	86 (89.6)	84 (84.0)	361 (90.3)
Vape juice without nicotine	3 (2.8)	2 (2.0)	3 (3.1)	6 (6.0)	14 (3.5)
Dry cannabis	2 (1.9)	0 (0.0)	0 (0.0)	1 (1.0)	3 (0.8)
Liquid cannabis	4 (3.8)	3 (3.0)	6 (6.3)	9 (9.0)	22 (5.5)

Know nicotine content¹

Yes	93 (95.6)	93 (98.9)	84 (97.7)	80 (95.2)	350 (97.0)
No	4 (4.4)	1 (1.1)	2 (2.3)	4 (4.8)	11 (3.0)

Device purchase location²

Retail location	28	46	17	46	137
Specialty vape shop	26	46	13	43	128
From a friend	34	7	48	21	110

Juice purchase location²

Retail location	35	49	17	50	151
Specialty vape shop	24	54	13	45	136
From a friend	38	6	50	10	104

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 13. *Product information for Prairies respondents.*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Type of e-cigarette					
Cig-a-like	1 (1.0)	1 (1.2)	0 (0.0)	1 (1.4)	3 (0.8)
Vape pen	18 (16.5)	19 (23.8)	31 (30.1)	18 (25.4)	86 (23.7)
Mod	13 (11.9)	16 (20.0)	14 (13.6)	9 (12.7)	52 (14.3)
Pod	77 (70.6)	44 (55.0)	58 (56.3)	43 (60.5)	222 (61.2)
Currently prefer flavoured vape juices¹					
Yes	87 (84.5)	72 (92.3)	87 (90.6)	61 (91.0)	307 (89.2)
No	16 (15.5)	6 (7.7)	9 (9.4)	6 (9.0)	37 (10.8)
Used flavoured vape juice at initiation					
Yes	97 (89.0)	75 (93.8)	97 (94.2)	69 (97.2)	338 (93.1)
No	12 (11.0)	5 (6.2)	6 (5.8)	2 (2.8)	25 (6.9)
Most used flavour at initiation					
Berry	36 (38.3)	19 (21.1)	34 (30.9)	21 (29.6)	110 (30.1)
Confectionary	15 (16.0)	16 (17.8)	19 (17.3)	7 (9.9)	57 (15.6)
Mango	9 (9.6)	6 (6.7)	19 (17.3)	10 (14.1)	44 (12.1)
Menthol	8 (8.5)	13 (14.4)	3 (2.7)	8 (11.3)	32 (8.8)
Tobacco	4 (4.3)	3 (3.3)	3 (2.7)	0 (0.0)	10 (2.7)
Other	22 (23.4)	33 (36.7)	32 (29.1)	25 (35.2)	112 (30.7)
Most used flavour at present					
Berry	18 (22.2)	18 (22.2)	28 (27.5)	14 (20.3)	78 (23.4)
Confectionary	4 (4.9)	2 (2.5)	5 (4.9)	3 (4.3)	14 (4.2)
Mango	13 (16.0)	24 (29.6)	15 (14.7)	9 (13.0)	61 (18.3)
Menthol	17 (21.0)	13 (16.0)	20 (19.6)	14 (20.3)	64 (19.2)
Tobacco	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0)
Other	29 (35.8)	24 (29.6)	34 (33.3)	29 (42.0)	116 (34.8)
Would you vape if you could not buy flavoured juices?¹					
Yes	62 (71.3)	41 (56.9)	51 (58.6)	25 (41.0)	179 (58.3)
No	25 (28.7)	31 (43.1)	36 (41.4)	36 (59.0)	128 (41.7)
Content added to vape juice					
Yes	27 (24.8)	19 (23.8)	32 (31.1)	2 (2.8)	80 (22.0)
No	82 (75.2)	61 (76.2)	71 (68.9)	69 (97.2)	283 (78.0)
Nicotine concentration¹					
10-20 mg/mL	4 (4.2)	10 (15.9)	7 (7.2)	6 (9.7)	27 (8.5)
35 mg/mL	22 (23.2)	16 (25.4)	18 (18.8)	18 (29.0)	74 (23.4)
50-60 mg/mL	69 (72.6)	37 (58.7)	71 (74.0)	38 (61.3)	215 (68.0)
Vaping product content at onset					
Vape juice with nicotine	73 (67.0)	54 (67.5)	65 (63.1)	58 (81.7)	250 (68.9)
Vape juice without nicotine	36 (33.0)	23 (28.8)	37 (35.9)	12 (16.9)	108 (29.8)
Dry cannabis	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	1 (0.3)
Liquid cannabis	0 (0.0)	3 (3.7)	1 (1.0)	0 (0.0)	4 (1.1)

Vaping product content at present

Vape juice with nicotine	104 (95.4)	74 (92.5)	97 (94.2)	69 (97.2)	344 (98.4)
Vape juice without nicotine	2 (1.8)	2 (2.5)	3 (2.9)	0 (0.0)	7 (1.9)
Dry cannabis	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0)
Liquid cannabis	3 (2.8)	4 (5.0)	3 (2.9)	2 (2.8)	12 (3.3)

Know nicotine content¹

Yes	103 (99.0)	73 (98.6)	97 (100.0)	66 (95.7)	339 (98.5)
No	1 (1.0)	1 (1.4)	0 (0.0)	3 (4.3)	5 (1.5)

Device purchase location²

Specialty vape shop	41	48	23	43	155
From a friend	42	5	51	7	105
Retail location	20	37	10	29	96

Juice purchase location²

Specialty vape shop	50	49	29	46	174
Retail location	21	39	11	31	102
From a friend	37	5	52	3	97

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 14. *Other substance use behaviours for the total sample.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	13.08 (22.12)	20.90 (27.76)	10.94 (14.67)	12.56 (18.49)	13.88 (20.99)
Days of cannabis use in the last 30 days*	11.21 (14.17)	14.91 (14.71)	10.45 (13.62)	13.96 (19.76)	12.48 (15.65)
Days of alcohol use in the last 30 days*	5.11 (8.23)	8.22 (11.47)	4.83 (6.78)	7.25 (8.19)	6.24 (8.88)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses.

Table 14. *Other substance use behaviours for the total sample (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	104 (20.3)	53 (11.3)	185 (35.8)	91 (24.3)	433 (23.1)
Former user	334 (65.2)	357 (76.3)	265 (51.2)	247 (66.0)	1203 (64.3)
Current user	74 (14.5)	58 (12.4)	67 (13.0)	36 (9.7)	235 (12.6)
Tobacco use onset relative to vaping onset¹					
Before	167 (40.9)	251 (60.5)	159 (47.9)	179 (63.3)	756 (52.6)
During	97 (23.8)	70 (16.9)	70 (21.1)	47 (16.6)	284 (19.7)
After	144 (35.3)	94 (22.6)	103 (31.0)	57 (20.1)	398 (27.7)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	192 (37.5)	150 (32.1)	212 (41.0)	106 (28.3)	660 (35.3)
No	320 (62.5)	318 (67.9)	305 (59.0)	268 (71.7)	1211 (64.7)
Type of drinker^{*2}					
Occasional drinker (1 drink/< 2wks.)	159	93	187	100	539
Light drinker (1-5 drinks/wk.)	62	89	72	89	312
Moderate drinker (6-10 drinks/wk.)	50	65	36	48	199

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner as the Nova Scotia survey and thus Nova Scotia data is excluded from these responses. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 15. *Other substance use behaviours for British Columbia respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	9.22 (6.91)	8.00 (7.45)	2.94 (2.01)	7.50 (8.74)	6.79 (6.46)
Days of cannabis use in the last 30 days	13.77 (12.66)	16.33 (13.06)	11.38 (13.39)	14.83 (25.51)	14.11 (16.82)
Days of alcohol use in the last 30 days	5.49 (7.56)	9.09 (8.98)	4.92 (5.84)	9.14 (8.19)	7.14 (7.96)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 15. *Other substance use behaviours for British Columbia respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	18 (20.9)	15 (18.8)	23 (30.7)	18 (24.3)	74 (23.5)
Former user	55 (64.0)	58 (72.5)	42 (56.0)	49 (66.2)	204 (64.8)
Current user	13 (15.1)	7 (8.7)	10 (13.3)	7 (9.5)	37 (11.7)
Tobacco use onset relative to vaping onset¹					
Before	31 (45.6)	35 (53.8)	13 (25.0)	33 (58.9)	112 (46.5)
During	14 (20.6)	12 (18.5)	15 (28.8)	7 (12.5)	48 (19.9)
After	23 (33.8)	18 (27.7)	24 (46.2)	16 (28.6)	81 (33.6)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	29 (33.7)	31 (38.8)	33 (44.0)	25 (33.8)	118 (37.5)
No	57 (66.3)	49 (61.2)	42 (56.0)	49 (66.2)	197 (62.5)
Type of drinker²					
Occasional drinker (1 drink/< 2wks.)	31	21	30	19	101
Light drinker (1-5 drinks/wk.)	16	29	23	23	91
Moderate drinker (6-10 drinks/wk.)	8	12	7	18	45

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 16. *Other substance use behaviours for Manitoba respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	3.78 (1.92)	32.33 (62.99)	8.75 (10.42)	15.33 (21.46)	13.23 (31.44)
Days of cannabis use in the last 30 days	10.01 (13.75)	12.44 (13.07)	11.42 (15.04)	15.02 (15.71)	11.91 (14.39)
Days of alcohol use in the last 30 days	5.30 (8.41)	5.41 (7.12)	5.60 (7.06)	7.00 (10.14)	5.72 (8.07)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 16. *Other substance use behaviours for Manitoba respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	10 (13.9)	4 (7.1)	25 (32.9)	8 (18.2)	47 (19.0)
Former user	52 (72.2)	45 (80.4)	42 (55.3)	33 (75.0)	172 (69.4)
Current user	10 (13.9)	7 (12.5)	9 (11.8)	3 (6.8)	29 (11.7)
Tobacco use onset relative to vaping onset¹					
Before	21 (33.9)	34 (65.4)	20 (39.2)	20 (55.6)	95 (47.3)
During	17 (27.4)	9 (17.3)	11 (21.6)	9 (25.0)	46 (22.9)
After	24 (38.7)	9 (17.3)	20 (39.2)	7 (19.4)	60 (29.9)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	32 (44.4)	17 (30.4)	28 (36.8)	11 (25.0)	88 (35.5)
No	40 (55.6)	39 (69.6)	48 (63.2)	33 (75.0)	160 (64.5)
Type of drinker²					
Occasional (1 drink/< 2 wks.)	33	20	39	17	109
Light (1-5 drinks/wk.)	8	15	13	13	49
Moderate (6-10 drinks/wk.)	12	8	12	3	35

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 17. *Other substance use behaviours for Nova Scotia respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	22.21 (39.06)	22.42 (17.59)	14.39 (16.99)	16.07 (23.48)	18.17 (23.65)
Days of cannabis use in the last 30 days*	---	---	---	---	---
Days of alcohol use in the last 30 days*	---	---	---	---	---

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner in the Nova Scotia survey and thus Nova Scotia data is excluded from these responses.

Table 17. *Other substance use behaviours for Nova Scotia respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	39 (28.1)	13 (8.6)	75 (44.9)	23 (27.1)	150 (27.6)
Former user	83 (59.7)	115 (75.7)	64 (38.3)	47 (55.3)	309 (56.9)
Current user	17 (12.2)	24 (15.7)	28 (16.8)	15 (17.6)	84 (15.5)
Tobacco use onset relative to vaping onset¹					
Before	49 (49.0)	100 (71.9)	67 (72.8)	45 (72.6)	261 (66.4)
During	20 (20.0)	18 (12.9)	10 (10.9)	10 (16.1)	58 (14.8)
After	31 (31.0)	21 (15.2)	15 (16.3)	7 (11.3)	74 (18.8)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	45 (32.4)	33 (21.7)	66 (39.5)	20 (23.5)	164 (30.2)
No	94 (67.6)	119 (78.3)	101 (60.5)	65 (76.5)	379 (69.8)
Type of drinker*					
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Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. *Denotes a question not asked in or not measured in the same manner in the Nova Scotia survey and thus Nova Scotia data is excluded from these responses. ¹Question not answered by all participants.

Table 18. *Other substance use behaviours for Ontario respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	12.75 (15.86)	13.00 (10.37)	10.50 (18.02)	7.00 (5.15)	11.41 (14.28)
Days of cannabis use in the last 30 days	12.63 (16.12)	15.37 (13.32)	9.17 (11.25)	14.42 (20.65)	12.92 (15.92)
Days of alcohol use in the last 30 days	4.78 (9.53)	8.95 (14.03)	4.24 (7.77)	6.41 (7.98)	6.08 (10.25)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 18. *Other substance use behaviours for Ontario respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	21 (19.8)	11 (11.0)	36 (37.5)	30 (30.0)	98 (24.4)
Former user	69 (65.1)	78 (78.0)	50 (52.1)	64 (64.0)	261 (64.9)
Current user	16 (15.1)	11 (11.0)	10 (10.4)	6 (6.0)	43 (10.7)
Tobacco use onset relative to vaping onset¹					
Before	29 (34.1)	48 (53.9)	28 (46.7)	44 (62.9)	149 (49.0)
During	22 (25.9)	16 (18.0)	12 (20.0)	11 (15.7)	61 (20.1)
After	34 (40.0)	25 (28.1)	20 (33.3)	15 (21.4)	94 (30.9)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	46 (43.4)	38 (38.0)	40 (41.7)	34 (34.0)	158 (39.3)
No	60 (56.6)	62 (62.0)	56 (58.3)	66 (66.0)	244 (60.7)
Type of drinker²					
Occasional (1 drink/< 2wks.)	48	30	61	41	180
Light drinker (5-1 drinks/wk.)	20	23	14	29	86
Moderate drinker (6-10 drinks/wk.)	10	22	8	15	55

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.

Table 19. *Other substance use behaviours for Prairies respondents.*

Variables	Male youth, <i>M (SD)</i>	Male young adults, <i>M (SD)</i>	Female youth, <i>M (SD)</i>	Female young adults, <i>M (SD)</i>	Total, <i>M (SD)</i>
Cigarettes smoked per week	12.80 (17.36)	22.50 (20.44)	9.80 (12.32)	10.00 (16.81)	12.65 (16.02)
Days of cannabis use in the last 30 days	8.62 (13.18)	14.66 (18.59)	10.25 (14.77)	11.68 (12.86)	10.99 (15.00)
Days of alcohol use in the last 30 days	5.02 (7.34)	8.39 (12.54)	4.73 (6.22)	6.61 (6.95)	6.00 (8.53)

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24.

Table 19. *Other substance use behaviours for Prairies respondents (continued).*

Variables	Male youth, N (%)	Male young adults, N (%)	Female youth, N (%)	Female young adults, N (%)	Total, N (%)
Tobacco use history					
Never user	16 (14.7)	10 (12.5)	26 (25.3)	12 (16.9)	64 (17.6)
Former user	75 (68.8)	61 (76.3)	67 (65.0)	54 (76.1)	257 (70.8)
Current user	18 (16.5)	9 (11.2)	10 (9.7)	5 (7.0)	42 (11.6)
Tobacco use onset relative to vaping onset¹					
Before	37 (39.8)	34 (48.6)	31 (40.3)	37 (62.7)	139 (46.5)
During	24 (25.8)	15 (21.4)	22 (28.6)	10 (16.9)	71 (23.7)
After	32 (34.4)	21 (30.0)	24 (31.1)	12 (20.4)	89 (29.8)
Knowledge of anyone who started vaping before smoking cigarettes					
Yes	40 (36.7)	31 (38.8)	45 (43.7)	16 (22.5)	132 (36.4)
No	69 (63.3)	49 (61.2)	58 (56.3)	55 (77.5)	231 (63.6)
Type of drinker²					
Occasional drinker (2 drinks/< 2wks.)	47	22	57	23	149
Light drinker (1-5 drinks/wk.)	18	22	22	24	86
Moderate drinker (6-10 drinks/wk.)	20	23	9	12	64

Note. Youth refers to ages 16-18. Young adult refers to ages 19-24. ¹Question not answered by all participants. ²Participants could choose from several answers. For this reason, only the frequencies of the top answers are reported.